Environmental Report

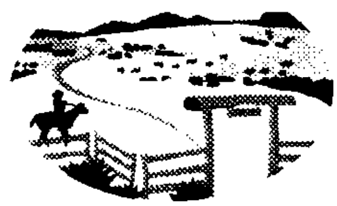
Prior to Construction through Demonstration Operation
(Prior to December 1990 through July 1995)

Air Quality

Water Quality

Solid Waste Disposal

Health and Safety



Ecological Impacts

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Executive Summary

This Environmental Report is a consolidation of the environmental monitoring results achieved throughout the historical development of the Advanced Coal Conversion Process (ACCP) Demonstration Project. The ACCP Demonstration Project is a U.S. Department of Energy (DOE) Clean Coal Technology Project. The Cooperative Agreement defining this project is between DOE and the Rosebud SynCoal Partnership.

This report examines the impacts, if any, the ACCP Demonstration Facility (located adjacent to the Rosebud Mine near Colstrip, Montana) has had on the environment and which developmental phases have had the greatest impact.

This historical timeline is defined as follows:

- Prior to Construction (prior to December 1990);
- Construction and Startup (December 1990 through May 1992);
- Extended Startup (May 1992 through August 1993); and
- Demonstration Operation (August 1993 to on going).

The environmental monitoring results are broken into five main categories:

- Air Quality;
- Water Quality;
- Solid Waste Disposal;
- Health and Safety; and
- Ecological Impacts.

Air Quality

There are two main types of air quality monitoring for the ACCP Demonstration Facility: particulate and stack emissions. Also reported are average process results for supplemental monitoring: combustion air pressure and temperature, natural gas flow and pressure, and stack temperature.

Ambient Air Particulate Testing: Total suspended particulate (TSP) data had been collected until May 12, 1992, when PM_{10} data collection was initiated according to the Montana and federal ambient particulate standards. There are eight monitoring stations for Colstrip: 1A, 1B, 9, 10, 11, 12, 13, and 14. Of the eight sites, four sites: 1A, 1B, 9, and 14 indicate impacts from the ACCP Demonstration Facility. The results according to the project time-line were within the standard except during construction, startup, and stabilization activities. These above-standard readings were easily traceable and were due to increased activities in the area or to poor weather conditions.

Stack Emission Testing: Emission testing for the ACCP Demonstration Facility performed in 1993 indicated that particulate emissions for the east outlet duct of baghouse D-8-56 averaged 0.0013 gr./dscf. The west outlet duct, the worst case of the two outlets ducts, registered average particulate emissions of 0.0027 gr./dscf or 15 percent of the 0.018 gr./dscf limit.

During the 1993 sampling, particulate emissions from the thermal process stack averaged 0.0158 gr./dscf or 51 percent of the 0.031 gr./dscf limit. Additional stack testing on May 18, 1994, determined the discharge rate of carbon monoxide, sulfur dioxide, and particulate and nitrogen oxides from the process stack. The results indicated that the assumptions in which the ACCP air quality permit were based on were valid. That is, no gaseous pollutant discharge rates were greater than 100 tons per year. However, the carbon monoxide emission rate, which was slightly higher than predicted, was probably due to the combined results of high inlet gas temperatures to the first-stage dryers and low oxygen levels in the furnace. The project modifications scheduled for the 1995 outage will address the high gas temperatures; however, the low oxygen levels will not be corrected at this time. The testing also confirmed that the particulate emissions are still below the permit level.

Process Parameters:
Combustion air pressure and temperature remained fairly consistent throughout project development. As operations became more efficient, natural gas flow rates and pressures continued to increase toward design specifications. Stack gas temperature actually decreased slightly as process performance was optimized.

Water Quality

Water quality compliance monitoring at the Rosebud Mine is very extensive. Approximately 434 groundwater wells at various depths and geological structures are monitored. The major importance of groundwater and surface water in the Colstrip vicinity is for livestock and wildlife uses; therefore, the criteria is slightly less stringent than for typical standard drinking water permissible levels.

Ten of the 434 groundwater wells were selected based on which wells would be impacted the most by the ACCP Demonstration Facility according to depth and proximity, both upgradient and downgradient to the Facility, to report water quality data for this report. The results were evaluated according to the following: 1) results of water analyses vs. water quality limits; 2) Prior to Construction (base-line data) vs. ACCP development timeline, and 3) upgradient wells (background) vs. downgradient. Also reported as supplemental monitoring results are average temperature results for cooling water supply and return.

Water quality results for the historical timeline based on the depth and type of well sampled indicate there was no impact to water quality throughout the development of the project. The additional constituents monitored before and during construction were comparable to base-line data and within the required limits. Additional sampling indicated slightly higher total dissolved solids, conductivity, and hardness levels in the spoil wells during the construction and extended startup period when compared with the base line; however, the elevated levels can be related to the geology of the overburden being backfilled. From 1992 to 1993, water quality actually improved from the base-line data. Water quality upgradient of the ACP Facility, monitoring wells WR-104 and WS-107, was compared with the remaining downgradient monitoring wells. Again, these results indicated there was no impact to water quality from constructing and operating the ACCP Demonstration Facility.

Process Parameters:
The cooling water supply and return temperatures were consistent throughout the historical development of the ACCP Demonstration Facility. The temperatures are well within the design limits for the cooling water tower.

Solid Waste Disposal

There are two main monitoring areas regarding solid waste disposal from the ACCP Demonstration Facility: process slack, including the groundwater where the slack is disposed; and process fines, including the groundwater where the fines are disposed.

Raw coal inlet flows were taken as supplemental monitoring to estimate the amount of waste that could be expected based on feed rates. Additional information based on coal analyses, product coal analyses and flows were not available to do more detailed material balances.

Test results from the slack material indicated that the materials are non-hazardous and non-toxic forming. Groundwater testing revealed that the method currently used to dispose of the slack has not degraded post-mine groundwater quality beyond what is normally expected or accepted in relation to pre-mine groundwater quality which tends to be marginal. The data also provides evidence that there has been no impact on post-mine groundwater quality due to the oxidation of pyrites in the buried pit slack.

As operations became more efficient throughout the project development, more coal was processed producing more product, slack and fines.

Process Slack:

- **Slack** - Prior to Construction, samples of Rosebud coal process slack were analyzed for EP toxicity and acid/base account. The results indicated that the materials are non-hazardous and non-toxic forming.

- **Groundwater** - The undisturbed groundwater in this area did not meet safe drinking water standards prior to mining. As such, WECo is held to agriculture usage groundwater quality natural to the Colstrip area. Three wells were drilled to intercept the predicted flow path providing greater confidence of obtaining representative water quality levels within the area of influence. Well WR-104, screened in the Rosebud aquifer, serves as an upgradient well and has been sampled for chemical analysis six times since 1979. Well WS-107 is a downgradient well, also screened in the Rosebud aquifer, but it has been in spoils since the coal was mined out. It has been sampled for chemical analysis four times since 1983.

  The Rosebud seam slack coal, groundwater, and EPA standard data, which are summarized in Table SLD-1, verify the chemical similarities between the process slack and top/bottom seam slack coal materials in terms of water soluble constituents. In addition, groundwater monitoring around the slack disposal area is covered as part of Section 6.2, Water Quality. As evident by post-mine spoil water quality data, the traditional burial of top/bottom seam slack coal in the bottom of the mined-out Rosebud seam has not degraded post-mine groundwater quality beyond what is normally expected or accepted in relation to pre-mine groundwater quality which tends to be marginal. It also provides evidence that there has been no impact on post-mine groundwater quality due to the oxidation of pyrites in the buried pit slack.

Process Fines:

- **Fines** - During facility development, samples from the slurry pit were collected both in January and April of 1993.

- **Groundwater** - Three wells were drilled to intercept the predicted flow path providing greater confidence of obtaining representative water quality levels within the area of influence surrounding the process fines slurry pit. Well WR-104, screened in the Rosebud aquifer, serves as an upgradient well and has been sampled for chemical analysis six times since 1979. Well WS-107 is a downgradient well, also screened in the Rosebud aquifer, but it has been in spoils since the coal was mined out. It has been sampled for chemical analysis four times since 1983. The chemical analysis is similar to surface water except no total recoverable analysis has been run on the groundwater samples. In addition, two samples were collected from actual slurry pit during Extended Startup.

Process Parameters:
As operations became more efficient throughout the project development, more coal was processed producing more product slack and fines.

Health and Safety

The ACCP Facility's employees' health and safety is a priority with the employees and with management. The ACCP Facility has had very low incident rates and severity rates with only minor incidents throughout the project's duration to date. All samples taken from mid-1992 through late-1993 indicate that noise readings were all below MSHA reporting limits of 135 decibels. Regular respirable dust inspections are also conducted by MSHA at the Facility.

Ecological Impacts

The ACCP Facility is constructed entirely inside of an active mine area. Because the Facility is located adjacent to an 80,000-ton, coal stockpile and unit train loadout facility, wildlife do not frequent this particular area. Also, the vegetation in this area is quite sparse. No impacts are anticipated beyond the Facility boundaries.

Mule deer and pronghorn antelope are the most common big game species in the proposed permit area although several white-tailed deer observations have been recorded. A small herd of elk is known to use an area several miles southwest of the area, and occasional elk sightings have been recorded for Area C.

Sharp-tailed grouse have been active in the area. Raptors are common and nests of the golden eagle, prairie falcon, Cooper's hawk, red-tailed hawk, great horned owl, short-eared owl, long-eared owl, and northern harrier have been located in the area. Three bald eagles were once observed soaring above the area and were believed to be transients because there is no evidence of their nesting in the area. A peregrine falcon was also observed in the study area and was assumed to be transient.

Several shrub/grassland and shrub/tree habitat types provide cover, forage and fawning (nesting) sites for big game, grouse, raptors, songbirds and other species. Other habitats of limited acreage, but equally important to wildlife, are the sandstone outcrops, and spring/seep and pond areas. One area of sandstone outcrop, approximately 13.2 acres known as "Eagle Rock", is particularly valuable as a golden eagle and falcon nesting site. The outcrop provides numerous nesting sites and is used more than most other outcrops in the area. In addition, the success rate for fledgling young is generally higher than elsewhere. The West Fork Armells Creek is important for wildlife habitat because of the concentration of rugged topography and dense vegetation in the intermittent reach with perennial pools which also supports thick vegetation. The creek is also important as a watering source. Ring-necked pheasant distribution is closely associated with riparian drainages of both the East Fork and upper portion of the West Fork Armells Creek. Observations of waterfowl have been restricted to area stock ponds and ephemeral streams. Castle Rock, as an erosion remnant, also provides topographic relief and, thus, provides additional diversity of wildlife habitat in a broad, open valley.

From Prior to Construction to date, no major inconsistencies have been noted in big game populations, upland game birds, non-game wildlife, and fisheries. The development and operations of the ACCP Demonstration Facility appear to have had little ecological impacts.

Conclusions and Recommendations

Current monitoring and compliance tasks are complete and cover all major aspects that could potentially be impacted by the ACCP Demonstration Facility. Past monitoring has been more than sufficient to evaluate the environmental impacts caused by the development of the ACCP Demonstration Facility throughout the historical timeline. No major environmental impacts from the ACCP Demonstration Facility were found.

Now that the facility is constructed and operational, the focus of monitoring and compliance should be directed more towards specific testing on various coals or treatment technologies for stabilization and dust mitigation. Therefore, the only recommendation, based on the data collected for this report, is to perform process testing and evaluation based on the various coals processed and any techniques used for product stabilization. The types of monitoring that should be performed are those typically needed for material and energy balances, such as:

- analyzing coal prior to processing;
- determining the amount of raw coal being processed;
- analyzing the emissions during processing;
- analyzing any waste;
- determining the amount of waste generated;
- analyzing the product;
- determining the amount of clean product produced; and
- gathering information on any chemical used for stabilization.

These forms of monitoring will determine if one coal type or treatment type impacts the environment more than another, how and why this coal or treatment type impacts the environment, and what can be done to limit the amount of environmental impact.

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1.0 Introduction

This Environmental Report is a consolidation of the environmental monitoring results achieved throughout the historical development of the Advanced Coal Conversion Process (ACCP) Demonstration Project. This report examines the impacts, if any, the ACCP Demonstration Facility has had on the environment and which developmental phases have had the greatest impact. (Complete detailed reports regarding these results are available upon request.)

The historical timeline is defined as follows:

- Prior to Construction (prior to December 1990);
- Construction and Startup (December 1990 through May 1992);
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The environmental monitoring results are broken into five main categories:

- Air Quality;
- Water Quality;
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- Ecological Impacts.

2.0 Background

The ACCP Demonstration Project is a U.S. Department of Energy (DOE) Clean Coal Technology Project. The Cooperative Agreement defining this project is between DOE and the Rosebud SynCoal Partnership. In brief, Western Energy Company (WECo) , which is a coal mining subsidiary of Entech, Inc., Montana Power Company's (MPC's) non-utility group in Colstrip, Montana, was the original proposer for the ACCP Demonstration Project and Cooperative Agreement participant. To further develop the ACCP technology, Entech created Western SynCoal Company. After the formation of the Rosebud SynCoal Partnership, WECo formally novated the Cooperative Agreement to the Rosebud SynCoal Partnership to facilitate continued participation in the Cooperative Agreement. The Rosebud SynCoal Partnership is a partnership between Western SynCoal Company and Scoria, Inc., a subsidiary of NRG Energy, Inc., Northern States Power's non-utility group.

This project demonstrates an advanced, thermal, coal conversion process, coupled with physical cleaning techniques, that is designed to upgrade high-moisture, low-rank coals to a high-quality, low-sulfur fuel, registered as the SynCoal® process. The coal is processed through three stages (two heating stages followed by an inert cooling stage) of vibrating fluidized bed reactors that remove chemically bound water, carboxyl groups, and volatile sulfur compounds. After thermal upgrading, the coal is put through a deep-bed stratifier cleaning process to separate the pyrite-rich ash from the coal.

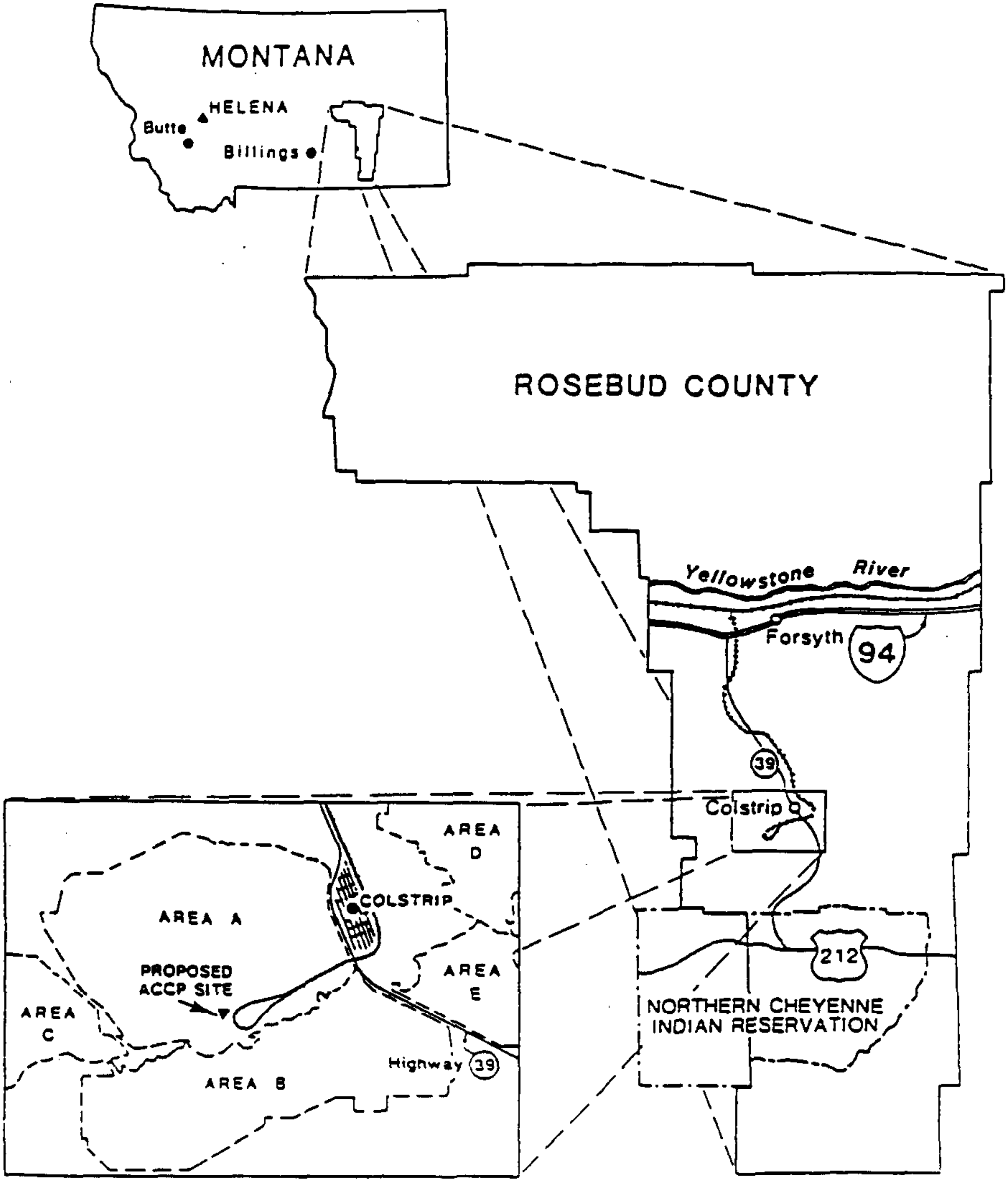
The SynCoal® process enhances low-rank, western coals, usually with a moisture content of 25 to 40 percent, a sulfur content of 0.5 to 1.5 percent, and heating value of 5,500 to 9,000 British thermal units per pound (Btu/lb.), by producing an upgraded coal product with a moisture content as low as 1 percent, a sulfur content as low as 0.3 percent, and a heating value up to 12,000 Btu/lb.

The 45-ton-per-hour unit is located adjacent to a unit train loadout facility at WECo's Rosebud coal mine near Colstrip, Montana. The ACCP Demonstration Facility is sized at about one-tenth the projected throughput of a multiple processing train commercial facility. The demonstration vibratory fluidized bed equipment is currently near commercial size.

2.1 Description of the ACCP Demonstration Facility and Rosebud Mine

The ACCP Demonstration Facility site is on WECo-controlled property adjacent to the existing mining and loadout activities in Rosebud County, Montana, approximately 2 miles southwest of Colstrip, Montana (Figure BKG-1). Figure BKG-2 depicts the ACCP Demonstration Facility's physical setting and facilities arrangement. Figure BKG-3 shows the WECo mine areas (Ref. 1).

Figure BKG-1. ACCP Demonstration Facility General Location Map



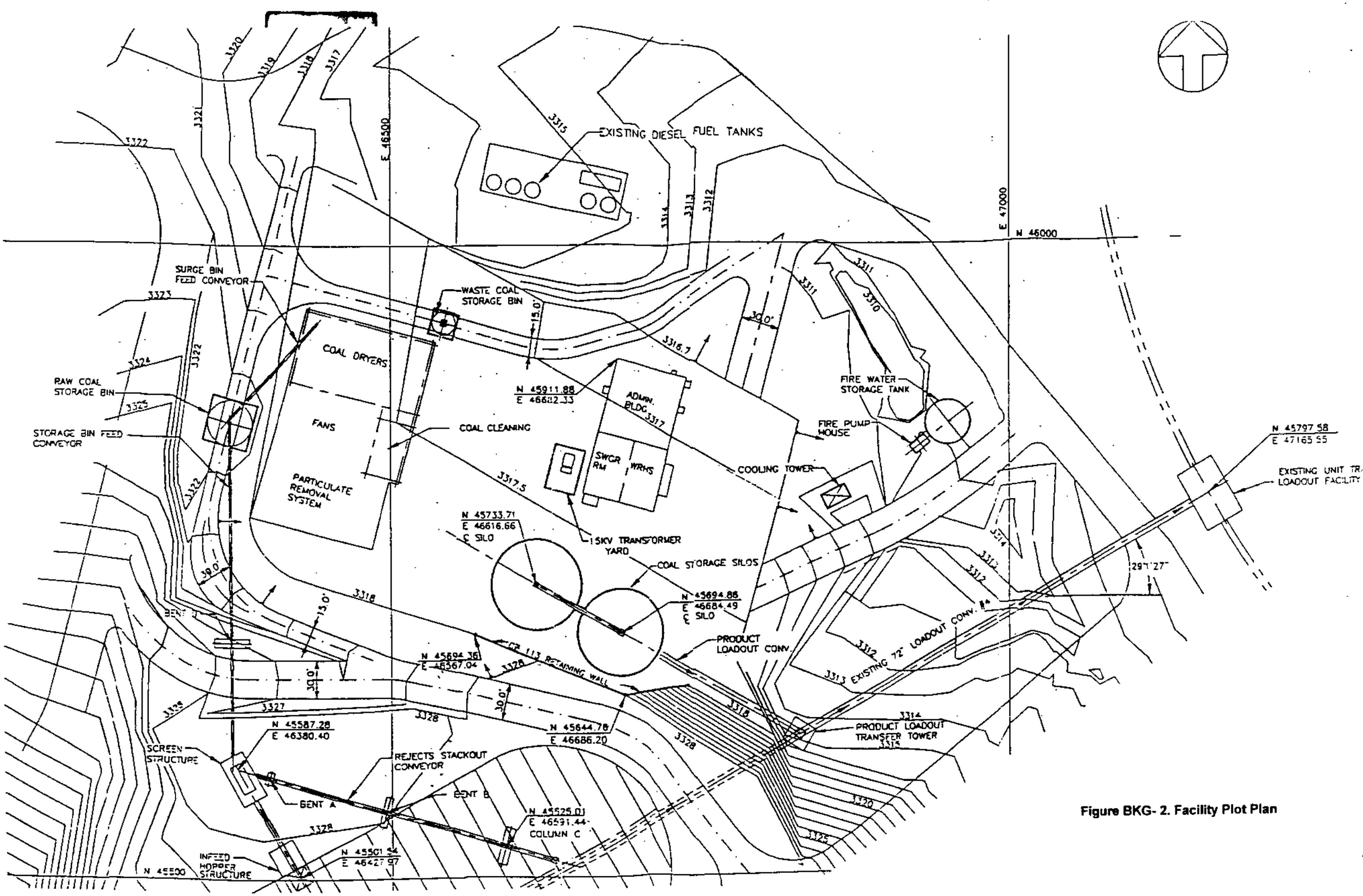
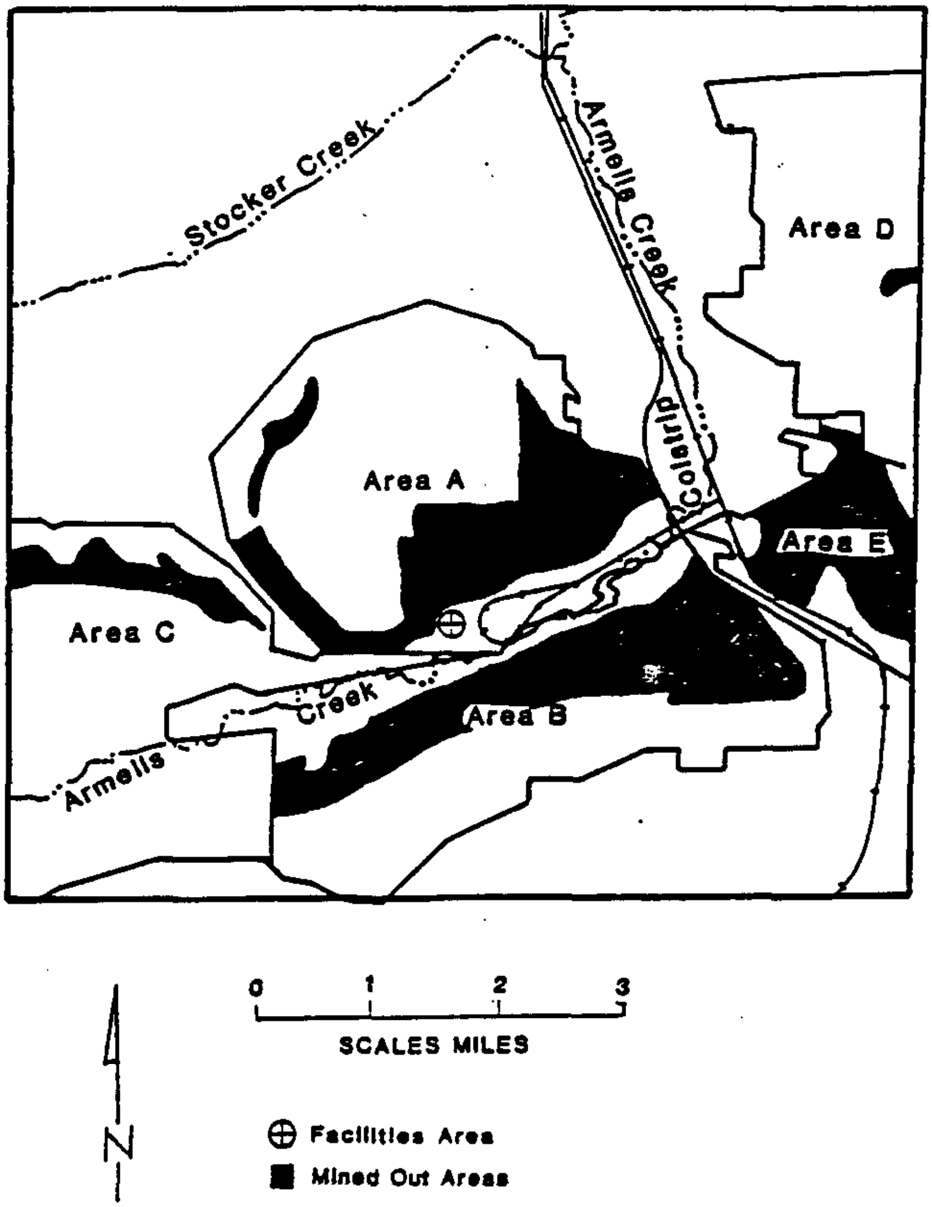


Figure BKG- 2. Facility Plot Plan

Figure BKG-3. Western Energy Company Rosebud Mine



WECo's Rosebud mine is an open-pit, surface coal mine extending over an area of approximately 48 square miles in which there are 4 areas of active mining: Areas A, B, C, and D (see Figure BKG-1). Areas C and D supply coal to MPC's generating units (Colstrip 1, 2, 3, and 4), and Areas A, B, and D supply coal for off-site customers. The coal is removed from under an overburden of between 40 and 200 feet, and the coal seam is approximately 25 feet thick. Twelve to sixteen million tons of SynCoal® are produced annually (Ref. 1).

2.1.1 Site Description

The ACCP Demonstration Facility is located adjacent to the unit train coal handling facility in Area A of the Rosebud Mine, near Colstrip, Montana. The mine falls under the jurisdiction of the Mine Safety and Health Administration (MSHA), the Montana Department of State Lands (MDSL), and the Montana Air Quality Bureau (MAQB).

Temperatures in the Colstrip area vary from a normal winter low of minus 15°F to a summer high of 94°F. The average yearly temperature is 60°F. The base elevation of the site is 3,318 feet with a corresponding barometric pressure of 13.1 pounds per square inch absolute (psia).

The ACCP Demonstration Facility is located in a fairly arid region; mean annual precipitation is slightly less than 16 inches. The soil is loose and porous. Groundwater is approximately 15 feet below original ground surface, and the frost depth is 60 inches.

2.1.2 Land Requirements

Colstrip has a population of approximately 4,500 and is presently unincorporated. The area outside of the existing mine plans, both east and west of Colstrip, is mainly native range used primarily for cattle grazing. There is some dry land farming that produces small grain and alfalfa.

Several major advantages regarding the ACCP Demonstration Facility's current location include (Ref. 1):

- Land use impacts are negligible because the Facility is located immediately adjacent to an existing mining and loadout facility.

- The ACCP Demonstration Facility is located on the mine site and has an associated truck dump, crusher, and tippling facility.

- Construction impacts are minimal given the existence of required ancillary facilities (e.g., coal handling facilities), industrial infrastructure (e.g., electrical supply), and the Colstrip community's ability to expand to meet short-term and long-term population growth requirements incurred by this project.

- Although plant-specific and cumulative impacts were foreseen to be minor, the present impact-monitoring network was used to evaluate impacts. Only minimal efforts were required to modify the existing system to be able to monitor environmental compliance at Rosebud Syncoal's ACCP Demonstration Facility.

2.1.3 Coal Resources and Characterization

The coal-upgrading process is used to reduce the moisture, ash, and sulfur content of the raw coal to significantly lower levels. Moisture content is reduced using thermal reactors, and ash and sulfur contents are reduced in a gravity separation process that follows the thermal upgrading process. Various properties of the feedstock and upgraded product are included in Table BKG-1.

2.2 Process Description

In general, the ACCP is a thermal conversion process that uses combustion products and superheated steam as fluidizing gas in vibrating fluidized bed reactors. Two fluidized stages are used to thermally and chemically alter the coal, and one water spray stage followed by one fluidized stage is used to cool the coal. Other systems that service and assist the coal conversion system include:

- Coal Conversion;
- Coal Cleaning;
- Product Handling;
- Raw Coal Handling;
- Emission Control;
- Heat Plant;
- Heat Rejection; and
- Utility and Ancillary.

2.2.1 Original Design Process Description

The designed central processes of the ACCP Demonstration Facility are depicted in Figure BKG-4. The following text discusses facility design aspects and expected results. Modifications and operating results are summarized in Section 2.2.4.

Coal Conversion

The coal conversion is performed in two parallel processing trains. Each train consists of two, 5-feet-wide by 30-feet-long vibratory fluidized bed thermal reactors in series, followed by a water spray section, and a 5-feet-wide by 25-feet-long vibratory cooler. Each processing train is fed up to 1,139 pounds per minute of 2-by-½ inch coal.

In the first-stage dryer/reactors, the coal is heated by direct contact with hot combustion gases mixed with recirculated dryer makegas, removing primarily surface water from the coal. The coal exits the first-stage dryer/reactors at a temperature slightly above that required to evaporate water and is then gravity fed to the second-stage thermal reactors, which further heats the coal using a recirculating gas stream. During the second stage, water trapped in the pore structure of the coal

Table BKG-1. Analysis of Raw Coal/Cleaned Coal from ACCP Demonstration Facility (6/12/94)

	Raw Feed ACOAL W-76		Cleaned Product ACOAL C-9-08	
	As Rec'd.	Dry	As Rec'd.	Dry
Proximate Analysis (%)				
Moisture	25.84		2.21	
Ash	9.89	13.34	9.62	9.84
Volatile	28.11	37.90	36.98	37.82
Fixed C	-36.16	48.76	51.19	52.34
Total	100.00	100.00	100.00	100.00
Sulfur	0.88	1.19	0.56	0.57
BTU/lb	8,507	11,471	11,785	12,051
MAFBTU		13,237		13,367
Ultimate Analysis (%)				
Moisture	25.84		2.21	
Ash	9.89	13.34	9.62	9.84
Sulfur	0.88	1.19	0.56	0.57
Nitrogen	0.87	1.18	1.23	1.26
Carbon	48.83	65.85	68.16	69.70
Hydrogen	3.46	4.67	4.70	4.81
Oxygen	10.23	13.77	13.52	13.82
Total	100.00	100.00	100.00	100.00
Chlorine	<0.01	<0.01	<0.01	<0.01
Mineral Analysis of Ash (%)				
Phosphorus Pentoxide	0.53		0.60	
Silicon Dioxide	42.67		45.39	
Ferric Oxide	6.79		1.34	
Aluminum Oxide	17.66		22.68	
Titanium Dioxide	1.09		1.32	
Manganese Dioxide	0.14		0.14	
Calcium Oxide	13.74		14.52	
Magnesium Oxide	3.51		4.34	
Potassium Oxide	0.50		0.27	
Sodium Oxide	0.24		0.29	
Sulfur Trioxide	12.30		8.34	
Barium Oxide	0.25		0.04	
Strontium Oxide	0.36		0.48	
Undetermined	0.22		0.25	
Total	100.00		100.00	
Forms of Sulfur (%)				
Sulfate	<0.01	<0.01	<0.01	<0.01
Pyritic	0.51	0.69	0.08	0.08
Organic	0.37	0.50	0.48	0.49
Total	0.88	1.19	0.56	0.57

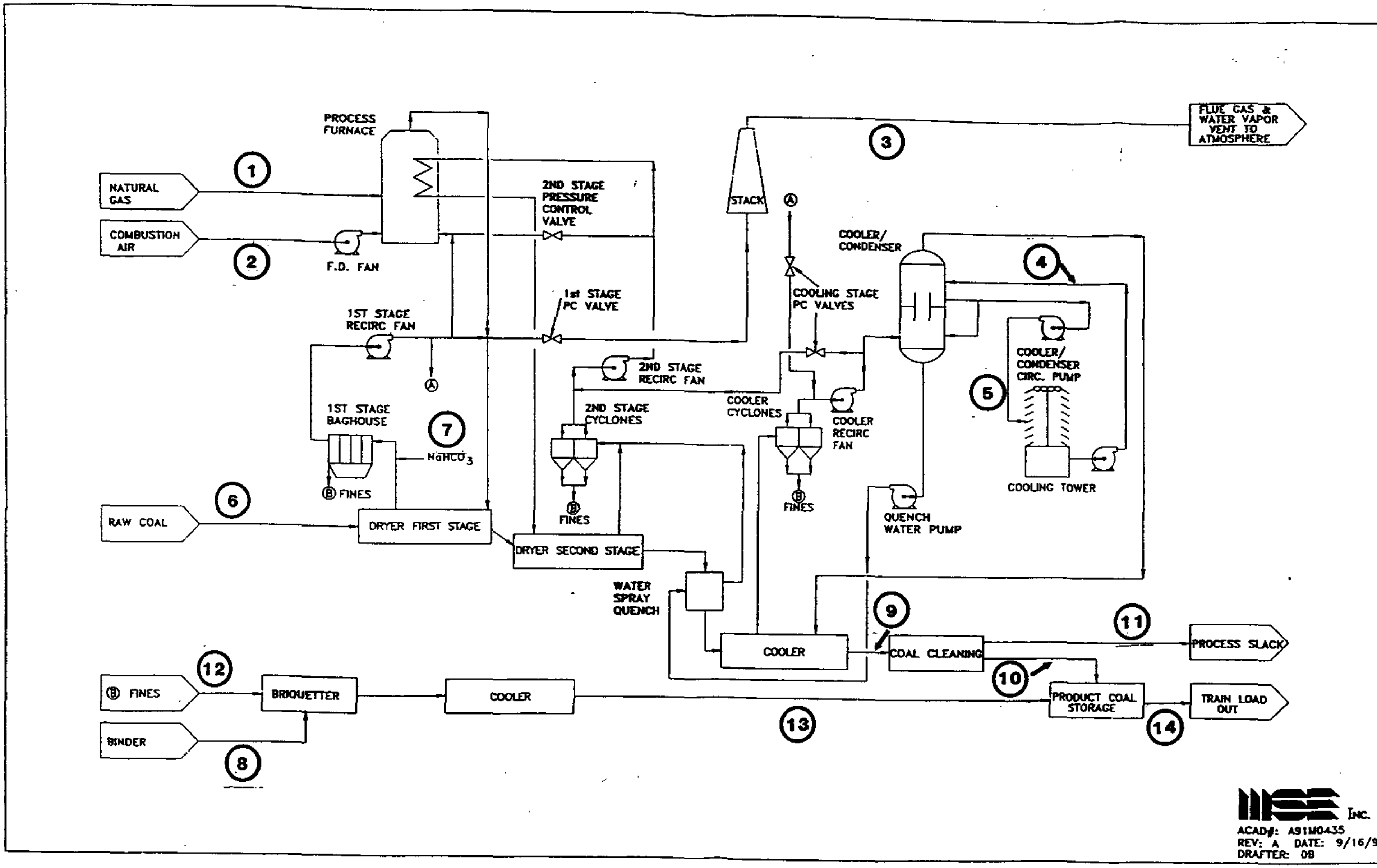


Figure BKG-4. Central Processes

is removed and chemical dehydration, decarbonylation, and decarboxylation is promoted. The water, which makes up the superheated steam used in the second stage, is actually produced from the coal itself. Particle shrinkage that occurs in the second stage liberates ash minerals and passes on a unique cleaning characteristic to the coal.

As the coal exits the second-stage thermal reactors, it falls through vertical quench coolers where process water is sprayed onto the coal to reduce the temperature. The water vaporized during this operation is drawn back into the second-stage thermal reactors. After water quenching, the coal enters the vibratory coolers where the coal is contacted by cool inert gas. The coal exits the vibratory cooler(s) at less than 150°F and enters the coal cleaning system. The gas that exits the vibratory coolers is dedusted in a twin cyclone and cooled by water sprays in direct contact coolers before returning to the vibratory coolers. Particulates are removed from the first-stage process gas by a pair of baghouses in parallel and the second-stage process gas by a quad cyclone arrangement.

Three interrelated recirculating gas streams are used in the coal conversion system; one each for the thermal reactor stages and one for the vibratory coolers.

Gases enter the process from either the natural gas-fired process furnace or from the coal itself. Combustion gases from the furnace are mixed with recirculated makegas in the first-stage dryer/reactors after indirectly exchanging some heat to the second-stage gas stream. The second-stage gas stream is composed mainly of superheated steam, which is heated by the furnace combustion gases in the heat exchanger. The cooler gas stream is made up of cooled furnace combustion gases that have been routed through the cooler loop.

A gas route is available from the cooler gas loop to the second-stage thermal reactor loop to allow system inerting. Gas may also enter the first-stage dryer/ reactor loop from the second-stage loop (termed makegas) without directly entering the first-stage dryer/reactor loop; rather, the makegas is used as an additional fuel source in the process furnace. The second-stage makegas contains various hydrocarbon gases that result from the thermal conversions associated with the mild pyrolysis and devolatilization. The final gas route follows the exhaust stream from the first-stage loop to the atmosphere.

Gas exchange from one loop to another is governed by pressure control on each loop and, after startup, is minimal from the first-stage loop to the cooler loop and from the cooler loop to the second-stage loop. Gas exchange from the second-stage loop to first-stage loop (through the process furnace) may be substantial since the water vapor and hydrocarbons driven from the coal in the second-stage thermal reactors must leave the loop to maintain a steady state.

In each gas loop, particulate collection devices that remove dust from the gas streams, protect the fans, and in the case of the first-stage baghouses, the closed system design prevents any fugitive particulate discharge. Particulates are removed from the first-stage process gas by a pair of baghouses in parallel. The second-stage process gas is treated by a quad cyclone arrangement, and the cooler-stage process gas is treated by a twin cyclone arrangement.

Coal Cleaning

The coal entering the cleaning system is screened into four size fractions: plus ½ inch, ½ by ¼ inch, ¼ inch by 6 mesh, and minus 6 mesh. These streams are fed in parallel to four, deep-bed stratifiers (stoners) where a rough specific gravity separation is made using fluidizing air and a vibratory conveying action. The light streams from the stoners are sent to the product conveyor, and the heavy streams from all but the minus 6 mesh stream are sent to fluidized bed separators. The heavy fraction of the minus 6 mesh stream goes directly to the waste conveyor. The fluidized bed separators, again using air and vibration to effect a gravity separation, each split the coal into light and heavy fractions. The light stream is considered product, and the heavy or waste stream is sent to a 300-ton, storage bin to await transport to an off-site user or alternately back to a mined out pit disposal site. The converted, cooled, and cleaned SynCoal® product from coal cleaning enters the product handling system.

Product Handling

Product handling consists of the equipment necessary to convey the clean, granular SynCoal® product into two, 6,000-ton, concrete silos and to allow train ,oading with the existing loadout system. Additionally, the SynCoal® fines collected in the various stage particulate collection systems are combined, cooled, and transferred tot a 300-ton storage silo designed for truck loadout to make an alternate product.

Raw Coal Handling

Raw coal from the existing stockpile is screened to provide 2-by-½ inch feed for the ACCP process. Properly sized coal is conveyed to a 1,000-ton, raw coal, storage bin that feeds the process facility. Coal rejected by the screening operation is conveyed back to the active stockpile.

Emission Control

Sulfur dioxide emission control philosophy is based on injecting dry sorbents into the ductwork to minimize the release of sulfur dioxide to the atmosphere. Sorbents, such as trona or sodium bicarbonate, are injected into the first-stage gas stream as it leaves the first-stage dryer/reactors to maximize the potential for sulfur dioxide removal while minimizing reagent usage. The sorbents, having reacted with sulfur dioxide, are removed from the gas streams in the particulate removal systems. A 60-percent reduction in sulfur dioxide emissions should be realized from using this process.

The coal cleaning area fugitive dust is controlled by placing hoods over the sources of fugitive dust that conveys the dust-laden air to fabric filter(s). The bag filters can remove 99.99 percent of the coal dust from the air before discharge. All SynCoal® fines will report to the fines handling system and ultimately the SynCoal® fines product stream.

Heat Plant

The heat required to process the coal is provided by a natural gas-fired process furnace, which uses process makegas from the second-stage coal conversion as a supplemental fuel. This system is sized to provide a heat release rate of 74 million (MM) Btu/hr. Process gas enters the furnace and is heated by radiation and convection from the burning fuel.

Heat Rejection

Most heat is rejected from the ACCP by releasing water and flue gas into the atmosphere through an exhaust stack. The stack design allows for vapor release at an elevation great enough that, when coupled with the vertical velocity resulting from a forced draft fan, dissipation of the gases will be maximized. Heat removed from the coal in the coolers is rejected using an atmospheric-induced draft cooling tower.

<u>Utility and Ancillary Systems</u>

Inert gas is drawn off the cooler loop for other uses. This gas, primarily nitrogen and carbon dioxide, is used for other baghouse pulse. The makeup gas to the cooler loop is combustion flue gas from the stack. The cooling system effectively dehumidifies and cools the stack gas making the inert gas for the system. The cooler gas still has a relatively high dew point (about 90°F). Due to the thermal load this puts on the cooling system, no additional inert gas requirements can be met by this approach.

Common ACCP Demonstration Facilities include a plant and instrument air system, a fire protection system, and a fuel gas distribution system.

The power distribution system includes a 15 kV service; a 15 kV/5 kV transformer; a 5 kV motor control center; two, 5 kV/480 V transformers; a 480 V load distribution center; and a 480 V motor control center.

The ACCP is semi-automated, including dual control stations, dual programmable logic controllers, and distributed plant control and data acquisition hardware. Operator interface is necessary to set basic system parameters, and the control system automatically adjusts to changes in the process measurements.

2.2.2 General Material and Energy Balance for the ACCP

A general material and energy balance around the ACCP Facility is shown in Figure BKG-5 on the following page. The description is for a typical coal that was tested and processed through the ACCP Demonstration Facility. An energy conversion of 87.1 percent is depicted. Loss of moisture up the stack accounts for the weight difference of input versus output.

A more detailed analysis of raw coal and product coal processed through the ACCP Demonstration Facility is shown in Table BKG-1 on page 8. These numbers are typical of production in 1994.

2.2.3 Original Equipment

The originally designed and installed major equipment for the ACCP Demonstration Facility is shown in Table BKG-2 on page 14.

Figure BKG-5 - General Material and Energy Balance

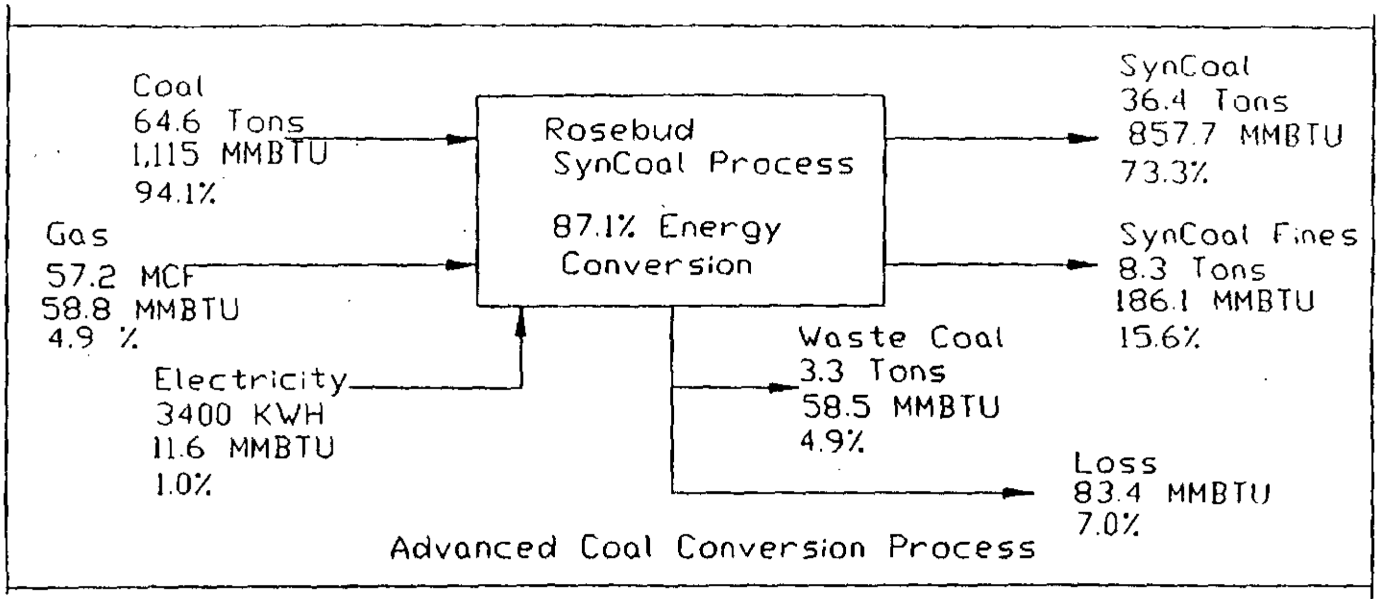


Table BKG-2. Advanced Coal Conversion Process Major Plant Equipment.

System Description	Equipment Vendor	Type
Thermal Coal Reactors/Coolers	Carrier Vibrating Equipment, Inc.	PE
Belt Conveyors	Willis & Paul Group	MH
Bucket Elevators	FMC Corporation	MH
Coal Cleaning Equipment	Triple S Dynamics, Inc.	CC
Coal Screens	Hewitt Robbins Corporation	MH
Loading Spouts	Midwest International	MH
Dust Agglomerator	Royal Oak Enterprises, Inc.	DH
Silo Mass Flow Gates	SEI Engineers, Inc.	MH
Vibrating Bin Dischargers	Carman Industries, Inc.	MH
Vibrating Feeder	Kinergy Corporation	MH
Drag Conveyor	Dynamet	DH
Process Gas Heater	G.C. Broach Company	PE
Direct Contact Cooler	CMI-Schneible Company	PE
Particulate Removal System	Air-Cure Howden	EC
Dust Collectors	Air Cure Environmental, Inc.	EC
Air Compressors/Dryers	Colorado Compressor, Inc.	CF
Diesel Fire Pumps	Peerless Pump Company	CF
Forced Draft Fans	Buffalo Forge Company	PE
Pumps	Dresser Pump Division Dresser Industries, Inc.	PE
Electrical Equipment-4160	Toshiba/Houston International Corporation	CF
Electrical Equipment-LDC	Powell Electric Manufacturing Company	CF
Electrical Equipment-480v MCC	Siemens Energy & Automation, Inc.	CF
Main Transformer	ABB Power T&D Company	CF
Control Panels	Utility Control & Equipment Corporation	CF
Control Valves	Applied Control Equipment	CF
Plant Control System	General Electric Supply Company	CF
Cooling Tower	The Marley Cooling Tower Company	PE
Dampers	Effox, Inc.	PE
Dry Sorbent Injec. System	Natech Resources, Inc.	EC
Expansion Joints	Flexonics, Inc.	PE

MH - Materials Handling PE - Process Equipment EC - Emissions Control
CF - Common Facilities CC - Coal Cleaning DH - Dust Handling

2.2.4 As-Built Process Description

The ACCP Facility has been modified as necessary during startup and operation of the ACCP Demonstration Project. Equipment has been improved; additional equipment installed; and new systems designed, installed, and operated to improve the overall plant performance. Those adjustments are listed below and on the following pages.

<u>Coal Conversion System</u>

In 1992, several modifications were made to the vibratory fluidized bed reactors and processing trains to improve plant performance. An internal process gas bypass was eliminated, and the seams were welded out to reduce system leaks. Also, the reactor bed deck holes were bored out in both the first-stage dryer/reactors and the vibratory coolers to increase process gas flows.

The originally designed, two-train, fines conveying system could not keep up with the fines production. To operate closer to design conditions on the thermal coal reactors and coolers, obtain tighter control over operating conditions, and minimize product dustiness, the ACCP Demonstration Facility was converted to single train operation to reduce the overall fines loading before modifying the fines handling system during the outage of the summer 1993. One of the two process trains was removed from service by physically welding plates inside all common ducts at the point of divergence between the two process trains. This forced process gases to flow only through the one open operating process train.

In addition to the process train removal, the processed fines conveying equipment was simultaneously modified to reduce required throughput on drag conveyors. This modification included adding a first-stage screw conveyor and straightening and shortening the tubular drag conveyors.

The ACCP design included a briquetter for agglomeration of the process fines. However, initial shakedown of the Facility required the briquetting system be completely operational. Since the briquetting operation was delayed to focus on successfully operating the Facility, the process design changes included fines disposal by slurrying them to an existing pit in the mine. During the Third Quarter 1992, a temporary fines slurry disposal system was installed. The redesigned process fines conveying and handling system was commissioned. A replacement fines conveying system has been designed and is now delivering to a truck loadout slurry or the briquetter.

The main rotary airlocks were required to shear the pyrite and "bone" or rock that is interspersed with the coal; however, the design of the rotary airlocks was insufficient to convey this non-coal material. Therefore, the drive motors were retrofitted from 2 to 5 horsepower for all eight process rotary airlocks. Also, an electrical current sensing circuit that reverses the rotary lock rotation was designed, tested, and applied to the rotary airlocks. This circuitry is able to sense a rotor stall and reverse the motor to clear the obstruction before tripping the motor circuit breaker.

The original facility startup tests also revealed explosion vent discrepancies in all areas, therefore preventing extended facility operation. The development of the vents was a cooperative effort between an explosion vent manufacturing company and the ACCP personnel and resulted in a unique explosion vent sealing system which was completed during the Second Quarter of 1993. The new explosion vent design was implemented during the Third Quarter of 1993 and has been performing well since.

Coal Cleaning

The coal entering the cleaning system is screened into four size fractions: plus ½ inch, ½ by ¼ inch, ¼ inch by 8 mesh, and minus 8 mesh. These streams are fed in parallel to four, deep-bed stratifiers (stoners) where a rough, specific, gravity separation is made using fluidizing air and a vibratory conveying action. The light streams from the stoners are sent to the product conveyor, and the heavy streams from all but the minus 8 mesh stream are sent to fluidized bed separators. The heavy fraction of the minus 8 mesh stream goes directly to the waste conveyor. The fluidized bed separators, again using air and vibration to effect a gravity separation, each split the coal into light and heavy fractions. The light stream is considered product, and the heavy or waste stream is sent to a 300-ton, storage bin to await transport back to the mined out pit disposal site. The dried, cooled, and cleaned product from coal cleaning enters the product handling system. Modifications that allow product to be sent to the waste bin with minimal reconfiguration were made in the Third Quarter of 1992.

Product Handling

Work continues on testing and evaluating technologies to enhance product stabilization and reduce fugitive dustiness. During the Fourth Quarter of 1992, a liquid carbon dioxide storage and vaporization system was installed for testing product stability and for providing inert gas for storage and facility startup/shutdown.

The clean product coal is conveyed into two, 5,000-ton capacity, concrete silos, which allow train loading with the existing loadout system. This capacity is due to the relatively low SynCoal® density.

Raw Coal Handling

Raw coal from the existing stockpile is screened to provide 1¼-by-½ inch feed for the ACCP process. Properly sized coal is conveyed to a 1,000-ton, raw coal, storage bin, which feeds the process facility. Coal rejected by the screening operation is conveyed back to the active stockpile.

Emission Control

It was originally assumed that sulfur dioxide emissions would have to be controlled by injecting chemical sorbents into the ductwork. Preliminary data indicated that adding the chemical injection sorbent would not be necessary to control sulfur dioxide emissions under the operating conditions. A mass spectrometer was installed during the Second Quarter to monitor emissions and process chemistry; however, the injection system is in place should a higher sulfur coal be processed or if process modifications are made and sulfur dioxide emissions need to be reduced.

The coal-cleaning area's fugitive dust is controlled by placing hoods over the fugitive dust sources conveying the dust laden air to fabric filter(s). The bag filters appear to be effectively removing coal dust from the air before discharge. The Department of Health and Environmental Sciences completed stack tests on the east and west baghouse outlet ducts and the first-stage drying gas baghouse stack during the Second Quarter of 1993. The emission rates of 0.0013 and 0.0027 (limit of 0.018 grains/dry standard cubic feet) (gr./dscf) and 0.015 gr./dscf (limit of 0.031), respectively, are well within the limits stated in the air quality permit.

Heat Plant

The heat required to process the coal is provided by a natural gas-fired process furnace, which uses process make gas from coal conversion as fuel. The vibration problems and conversion system problems discussed previously initiated removing and redesigning the process gas fans shaft seals to limit oxygen infiltration into the process gas. This system provides a maximum heat release rate of up to 74 MM Btu/hr depending on the feed rate.

Heat Rejection

Heat removed from the coal in the coolers is rejected indirectly through cooling water circulation using an atmospheric-induced, draft-cooling tower. A substantial amount of the heat added to the system is actually lost by releasing water vapor and flue gas into the atmosphere through an *exhaust stack. The stack allows for vapor release at an elevation great enough that, when* coupled with the vertical velocity resulting from a forced draft fan, maximized dissipation of the gases results.

Utility and Ancillary Systems

The coal fines that are collected in the conversion, cleaning, and material handling systems are gathered in the slurry system as produced. A replacement fines conveying system was designed and installed. The fines handling system consolidates the coal fines that are produced in the conversion, cleaning, and material handling systems. The fines are gathered by screw conveyors and transported by drag conveyors to a bulk cooling system, where the cooled fines are stored in a 250 ton capacity bin until loaded into pneumatic trucks for off-site sales. When off-site sales lag production, the fines are mixed with water in a specially designed tank and slurried back to the mine pit.

During the Fourth Quarter of 1993, an additional inert gas system was installed. The inert gas system cools, dehumidifies, compresses, and dries stack gas. The inert gas, which contains mainly nitrogen and carbon dioxide, is used by the first stage baghouse cleaning blowers and is also used as a blanket gas in the product and fines storage silos.

The common facilities for the ACCP include a plant and instrument air system, a fire protection system, and a fuel gas distribution system.

The ACCP Demonstration Facility's power distribution system was upgraded by installing an uninterruptible power supply (UPS) during the Fourth Quarter of 1992. The UPS system does not keep the Facility running if there is a problem; however, it does keep the control system, emergency systems, and office lights operating.

The ACCP is semi-automated, including dual control stations, dual programmable logic controllers, and distributed plant control and data acquisition hardware. Graphic interface programs are continually being modified and upgraded to improve the operator interface and to provide more reliable information to the operators and engineers.

2.2.5 Modified or Replaced Equipment

Facility modifications and maintenance work to date have been dedicated to obtaining an operational facility.

The modifications to the original system performed to date are listed below.

First Quarter 1992:

Air Compressors/Dryers:

- Rebuilt air compressor foundations.

Forced Draft Fans:

- Rebuilt foundation pedestals for process gas fans.
- Replaced rotor shafts on second-stage fans.
- Removed and redesigned shaft seals on process gas fans.

Second Quarter 1992:

Thermal Coal Reactors/Coolers:

- Upgraded process rotary air locks - increased from 2 to 5 horsepower and adding reversing starters.
- Rebuilt reactor hood seals - fixed seal design problems and seal leaking joints.
- Improved the vibratory fluidized beds - eliminated process gas bypass/welding out seams,etc.

Drag Conveyor:

- Modified processed fines conveying equipment to reduce required throughput on drag conveyors by adding a first-stage screw conveyor and straightening and shortening tubular drag conveyors.

Facility Control System:

- Continued rewriting operator graphic interface programs.

General:

- Replaced and upgraded explosion relief panels - went through design/trials.

Third Quarter 1992:

Thermal Coal Reactors/Coolers:
- Repaired second-stage vibratory fluid bed reactors.

Process Gas Heater:
- Sealed the process gas heat exchanger.

Drag Conveyors:
- Modified the processed fines conveying equipment.
- Installed temporary slurry fines disposal system.

Fourth Quarter 1992:

Instrumentation:
- Installed a mass spectrometer for process gas analysis.

General:
- Started pump house installation for cold weather.
- Installed an automatic knife and divert gates on the process surge bins.
- Installed liquid carbon dioxide storage and vaporization system for testing.

Cooling Tower:
- Installed a larger cooling water line to the cooling tower for increased quench cooling capacity.

Electrical Equipment:
- Installed an un-interruptible power supply (UPS).

Process Gas Heater:
- Replaced the main process heat exchanger expansion joint.

Forced Draft Fans:
- Upgraded fan shaft seal to limit oxygen infiltration into the process gas.
- Installed fan insulation.

Thermal Reactors/Coolers:
- Replaced every bearing on the drying and cooling vibro-fluidized beds due to a factory flaw.
- Upsized cooler bed holes for increased cooling gas flow.

Drag Conveyors/Screw Conveyors:
- Installed new Flights on C-15.

- Modified the dust conveying and handling equipment.
- Modified temporary slurry disposal system.
- Installed first-stage PRS screw conveyor.

<u>First Quarter 1993</u>:

Drag Conveyor:

- Designed a replacement fines conveying system.

Thermal Coal/Reactor:

- Repaired a structural crack between the drive and the main housing of dryer R552; insulation is being added to protect this area.

First-stage Baghouse:

- A mine electrical ground fault tripped the entire substation's power. After restarting, the Facility was tripped by a voltage dip when a dragline started which resulted in the fines in the dust collectors freezing from condensation and washdown water. The fines blocked the discharges. When the Facility was restarted, fines backed up into the bags and began smoldering, thus, damaging the bags.

<u>Second Quarter 1993</u>:

Forced Draft Fans:

- Repaired first-stage fan motor.

Process Gas Heater:

- Repaired furnace temperature transmitter.
- Repaired a ruptured expansion joint.

Processed Fines Handling System:

- Installed the new dust handling system.

<u>Third Quarter 1993</u>:

Process Gas Heater:

- Cleaned a fouled process heat exchanger.

Processed Fines Handling System:

- Commissioned the redesign of the process fines conveying and handling system.
- Cleaned a plugged fines chute.

Fourth Quarter 1993:

Processed Fines Handling System:

- Modifications, except for the processed fines cooler performance testing, which is not yet scheduled, have been completed.

Process Gas Heater:

- The Facility was shut down for a scheduled 24-hour maintenance outage to clean the process gas heat exchanger.

Forced Draft Fans:

- Replaced two fan bearings.

Baghouse:

- Conducted a scheduled baghouse repair.

First Quarter of 1994:

Processed Fines Handling System:

- Modifications, except for the processed fines cooler performance testing, which is not yet scheduled, have been completed.
- Repaired two broken rotary airlocks.

Forced Draft Fans:

- Repaired motor/bearing vibration.

Process Gas Heater:

- Repaired a blown expansion joint.
- Repaired two furnace trips (frozen flame scanner).

Drag Conveyor:

- Repaired a drag conveyor problem.

General:

- Reinstalled electricity due to an electrical interruption.

Second Quarter of 1994:

Processed Fines Handling System:

- Repaired the fines conveyor.
- Repaired a seal on T-90 fines storage bin.
- Repaired failed rotary airlocks.

Forced Draft Fans:

- Repaired fault RTD jumper on K-45 first-stage fan.

Process Gas Heater:

- Replaced a series of blown expansion joints.
- Repaired a furnace trip.

Heat Exchanger:

- Repaired a crack in the heat exchanger.

General:

- Restored electricity after a lightening strike caused a 13-hour outage.

Third Quarter 1994:

Common Facilities:

- Tied in a new inert gas system.

Conversion Systems:

- Modified some process ductwork.

Heat Rejection System:

- Replaced the cooling tower packing.

General:

- Checked and maintained all facility equipment.

Table BKG-3 on page 23 shows the equipment that has either been modified or replaced from facility startup. If a replacement was required, the new equipment is listed.

2.2.6 Required Permitting

In 1980, WECo applied for, and was issued on November 22, Air Quality Permit #1483 for Areas A, B, and E of the Rosebud Mine at Colstrip, Montana. In preparation for mining in Area D, WECo was issued Air Quality Permit # 1483A on September 6, 1985. To facilitate administration, the Air Quality Bureau consolidated permits #1483 and #1483A on January 6, 1986, and titled the new permit #1483B. On October 6, 1987, this permit was modified to #1483C. The new permit was issued for Areas A, B, D, and E of the Rosebud Mine, as well as the ACCP Demonstration Facility. Due to changes in the ACCP operation, WECo was issued permit #1483D on July 22, 1988. Once again, changes in operation at the ACCP were selected when the air quality permit was modified on June 25, 1991, and given the present designation #1483E.

The following permits and revisions have been approved for the ACCP Demonstration Facility:

MR 87-03-01A Plant. Approved November 27, 1990.

MR 92-03-01A Slurry to pit. Approved February 16, 1995.

MR 94-03-03B ACCP coal stack disposal in Area B. Approved February 13, 1995.

MR 93-03-03A Slack disposal in Area A. Approved May 5, 1994.

Table BKG-3. Advanced Coal Conversion Process Modified Major Plant Equipment

System Description	Equipment Vendor	Type	Modified No/Yes	Replaced With
Thermal Coal Reactors/Coolers	Carrier Vibrating Equipment, Inc.	PE	/✓	
Belt Conveyors	Willis & Paul Group	MH	/	
Bucket Elevators	FMC Corporation	MH	/	
Coal Cleaning Equipment	Triple S Dynamics, Inc.	CC	/	
Coal Screens	*Hewitt Robbins Corporation*	*MH*	/	
Loading Spouts	Midwest International	MH	/	
Dust Agglomerator	Royal Oak Enterprises, Inc.	DH	/	
Silo Mass Flow Gates	SEI Engineers, Inc.	MH	/	
Vibrating Bin Dischargers	Carman Industries, Inc.	MH	/	
Vibrating Feeder	Kinergy Corporation	MH	/	
Drag Conveyor	Dynamet	DH	/✓	
Screw Conveyor	Farm Aid Equipment Company	MH	Added	
Processed Fines Handling Sys.				
Bucket Elevators	*Continental Screw Conveyor Corp.*	*DH*	Added	
Screw Conveyors	Continental Screw Conveyor Corp.	DH	Added	
Drag Conveyors	AshTech Corporation	DH	Added	
Processed Fines Cooler	Cominco Engineering Services, Ltd.	DH	Added	
Slurry Tank Agitator	Chemineer, Inc.	DH	Added	
Slurry Tank	Empire Steel Manufacturing Co.	DH	Added	
Slurry and Pit Pumps	Goulds Pumps/Able Technical	DH	Added	
Processed Fines Load Out Bin	P & S Fabricators	DH	Added	
Process Gas Heater	G.C. Broach Company	PE	/	
Direct Contact Cooler	CMI-Schneible Company	PE	/✓	
Particulate Removal System	Air-Cure Howden	EC	/✓	
Dust Collectors	Air Cure Environmental	EC	/	
Air Compressors/Dryers	Colorado Compressor, Inc.	CF	/✓	
Diesel Fire Pumps	Peerless Pump Company	CF	/	
Forced Draft Fans	Buffalo Forge Company	PE	/✓	
Pumps	Dresser Pump Division Dresser Industries, Inc.	PE	/	
Electrical Equipment-4160	Toshiba/Houston International Corp.	CF	/	
Electrical Equipment-LDC	Powell Electric Manufacturing Corp.	CF	/	

Table BKG-3 Advanced Coal Conversion Process Modified Major Plant Equipment (cont'd.).

Electrical Equipment-480v MCC	Siemens Energy & Automation, Inc.	CF	/	
Uninterruptible Power Supply	Best Power Technologies Company	CF	Added	
Main Transformer	ABB Power T&D Company	CF	/	
Control Panels	Utility Control & Equipment Corp.	CF	/	
Control Valves	Applied Control Equipment	CF	/	
Plant Control System	General Electric Supply Company	CF	/✓	
Cooling Tower	The Marley Cooling Tower Company	PE	/✓	
Dampers	Effox, Inc.	PE	/	
Dry Sorbent Injec. System	Natech Resources, Inc.	EC	/	
Expansion Joints	Flexonics, Inc.	PE	/✓	

MH - Materials Handling   PE - Process Equipment   EC - Emissions Control
CF - Common Facilities   CC - Coal Cleaning   DH - Dust Handling

3.0 Project Status

The ACCP Demonstration Facility continues to operate in an environmentally and technically feasible mode of operation. Future work continues to focus on improving product stability and reducing dustiness.

The following tasks will continue to be pursued through future Demonstration Operation:

- Identify efficient and effective handling techniques.
- Demonstrate the benefits of SynCoal® in the smaller, more constrained industrial boilers and older, smaller utility boilers.
- Develop additional methods to reduce the product's spontaneous combustion potential.
- Demonstrate abilities to reduce production costs.
- Continue to monitor all environmental impact to air, water, solid waste, ecological and health and safety concerns resulting from operating the ACCP Demonstration Facility.

The environmental impacts will continue to be monitored and will be reported to the Department of Energy in a final report.

4.0 Quality Assurance and Quality Control

Quality Assurance (QA) is a system for ensuring that all information and data gathered under a specific task are technically sound, statistically solid, and properly documented. Quality Control (QC) is the mechanism through which quality assurance achieves its goals. A quality control program defines the frequency, methods of check and audits, and reviews necessary to identify problems and dictate corrective action, thus verifying product quality.

4.1 Purpose and Scope

A well-planned QA/QC program is absolutely necessary for obtaining reliable monitoring data and method verification. Four fundamental principals must be considered: 1) responsibility for QA must extend to all areas of management; 2) specification of the quality of data must be explicit; 3) the program must have adequate steps to assure that data of needed quality is obtained; and 4) implementable and effective corrective actions must be taken when data are of unacceptable quality. The QA/QC program addresses: 1) sampling; 2) analysis; 3) method and data verification; 4) sample management; and 5) data reporting.

4.2 Implementation of the QA/QC Program

Following is a detailed outline of the critical elements of the plan implemented for the EMP activities.

4.2.1 Organization

1. Qualifications and background of all ACCP personnel involved with the sampling and analysis is documented.
2. Specifications of responsibilities for all personnel involved with sampling and analysis is clearly defined and documented.
3. A chain of custody procedure for samples taken by ACCP personnel and sent to commercial laboratories is used to ensure the integrity of the sample.
   A sample will be considered to be under custody if:

   a. It is the possession of an authorized individual; or
   b. It is in view of, after being in the possession of an authorized individual; or
   c. It has been secured by the authorized individual to prevent tampering; or
   d. It has been placed in a designated secure area.

   To prevent misidentification, sample request forms are filled out at the time of collection and affixed to the sample container(s) (see Figure QA/QC-1). A field log book is also used to record sample information such as date time, origin, type of sample (grab or composite), preservatives, collectors identification, and general observations.

Figure QA/QC-1. Sample Coal Analysis Request/Report

Lab Sample ID ______

Origin: ACCP _____ Other _______ A _____ B _____ C _____ D _____

Sample Number ________________________

Sample Description ______________________________ (include coordinates for input samples)

Date(s) Collected ________________________

Date Delivered _________________________ By __________________________

Time Delivered _________________________ Received by _______________________

Analysis Requested: ___ Short Prox ___ Moisture Only ___ Size Analysis

___ Reabsorption ___ Other ________________________

Gross Sample Weight _____________________________

SHORT PROX RESULTS

Results:	**As Received**	**Dry Basis**
% Moisture	________	N/A
% Ash	________	________
% Sulfur	________	________
BTU/lb	________	________
MAF BTU/lb	________	
Lb Sulfur / MM BTU	________	

Screen Analysis Results

Size	Weight %	Cumulative % Passing	Cumulative Retained

Please state screen mesh size

Date Reported: __________

By: ____________________

Comments: ____

The sample request form also acts as the chain of custody record and is signed off as the sample proceeds through the transport, preparation, and analysis process. The following information is noted:

Sample origin
Sample I.D. number
Sample description
Date(s) collected
Date(s) delivered
Signature of collector/deliverer
Signature of receiver
Requested analysis
Analysis results
Date(s) analysis is reported
Signature of reporter

4. An alert system for unsatisfactory or unexpected results is used. Performance charts are generated for each determination to reflect laboratory performance on duplicates, control and spiked samples. Upper and lower control limits are established at $\pm$ 3 standard deviations from the mean or true value. Any result falling outside these control limits is brought to the attention of the QA/QC coordinator.

4.2.2 Records

1. Records of all relevant data is easily accessible and maintained.
2. Logbooks are kept detailing all samples showing sample time, date obtained, source, sampler, analyst, dates analyzed and reported, etc. Sample or laboratory identification numbers are given for those samples sent off-site.
3. All laboratory data is written in ink in laboratory data books which is reviewed by the QA/QC coordinator on a periodic basis.
4. Records or all graphs, charts and calibrations are kept.
5. Records of sample preparation are kept in laboratory notebooks.
6. An inventory control system is implemented for supply procurement, replacement, and storage.

4.2.3 Sampling Procedure

1. A procedures manual is kept available. All samplers are familiar with its content which delineates the details on sampling locations, sample type, duration of sampling, sample volume, sample collection methods and holding times, equipment to be used for sample collection, sample containers, pretreatment of containers, type and amount of preservative to be used, blanks, duplicates, spikes, chain of custody and any other pertinent information.
2. A detailed sample schedule is prepared providing information on sample frequency and number of samples needed.
3. Preservation and storage protocols are available to samplers and analysts.
4. Container protocols for each parameter is available to samplers and analysts.

4.2.4 Instruments

1. Laboratory personnel are properly trained in the operation and maintenance of laboratory and analytical instruments.
2. Detailed operational procedures are available.
3. Records of periodic inspection, calibration, maintenance and service are kept on file in the laboratory. An example of air quality monitoring equipment calibration is provided in Appendix A.
4. Manufacturers manuals are available to assist in installation, operation and service functions.
5. Analytical instruments are checked periodically and maintained by the Rosebud SynCoal Partnership and trained factory service technicians as required.

4.2.5 Measurement/Analysis

1. A laboratory manual detailing specified procedures (e.g., EPA, ASTM, APHA) for each parameter is available.
2. Any modification to the above procedures is noted either in the individual laboratory notebook or the aforementioned manual, including the reasons(s) for the change.
3. Purity of reagents and chemicals are specified. All reagents show date prepared and chemicals show date of receipt.
4. Calculation of results are clearly defined by examples or by a computer program and include significant figures, proper units and limits of detection where appropriate.
5. An analytical result report sheet is prepared showing identification of sample, date taken, date analyzed, analyst, notebook numbers, results, etc.

4.2.6 QA Procedures

1. All calculations are checked.
2. Spiking of samples in both the field and laboratory are practiced for appropriate tests.
3. Blanks are run routinely to determine interference from procedures, equipment or reagent.
4. Replicates are run routinely to allow an evaluation of the precision of various tests.
5. Standards that can be traced back to primary standards are used and checked routinely.
6. Recovery experiments are conducted for appropriate tests.
7. Control charts are prepared to document actual levels of accuracy and precision.
8. The laboratory enters a round-robin testing program for limited analyses. This is primarily directed to address coal testing procedures and techniques.
9. Samples are split from time to time for check analyses by a secondary laboratory.
10. A record of all QA/QC data is kept on file.
11. Method verification and matrix effects are checked by sample spiking at various levels and analysis to document actual levels of accuracy and precision.

4.2.7 Quality Assurance Audits

An independent quality assurance audit program is conducted by the QA/QC coordinator by submitting blind samples to the laboratory for certain critical analyses. Samples may consist of spikes, samples previously analyzed, duplicates, standards, etc., to provide an independent determination of possible problem areas. Results of analyses which exceed acceptable limits (as established by NBS, EPA, APHA, etc.) will be considered out of control and immediate steps will be undertaken to correct the situation.

4.2.8 Contracted Analytical Work

It is anticipated that much of the environmental compliance and monitoring testing is performed by contract or commercial laboratories. These laboratories are required to demonstrate equivalency to this QA/QC program as evidenced by certification approval by the State and/or the EPA. Also, besides reporting sample data, the commercial laboratories are requested to provide chain of custody information and quality control test data such as date, time and results of most recent calibration checks, recovery data from spikes, etc.

5.0 Environmental Monitoring Plan Description for ACCP Demonstration Facility

As specified in the Corporate Agreement, the Rosebud SynCoal Partnership developed an Environmental Monitoring Plan (EMP) which describes, in detail, the environmental monitoring activities to be performed during the project execution. The EMP: identifies monitoring activities that will be undertaken to show compliance to applicable regulations; confirms the specific environmental impacts predicted in the National Environmental Policy Act documentation; and establishes an information base regarding the assessment of the environmental performance of the technology demonstrated by the project.

The EMP specifies the streams to be monitored (e.g. gaseous, aqueous, and solid waste), the parameters to be measured (e.g. temperature, pressure, flow rate), and the species to be analyzed (e.g. sulfur compounds, nitrogen compounds, trace elements) as well as human health and safety exposure levels.

The operation and frequency of the monitoring activities are also specified in the EMP. The monitoring is broken down into two groups:

- **Compliance Monitoring**, which is monitoring that is or will be required under existing and/or anticipated regulatory requirements or permit conditions; and

- **Supplemental Monitoring**, which includes activities deemed important to measure operational or environmental performance but are not required to be measured by permits or regulations.

The specific items from the EMP that were used as a basis for the Environmental Report are described in Sections 5 and 6. The associated results provided in Section 6.0 are based on the historical timeline described in Section 1.0.

Table EMP-1 identifies the streams, parameters, and the frequency of processing monitoring; whereas, Table EMP-2 identifies the streams, parameters, and frequency of non-process monitoring.

Table EMP-1 ACCP Stream Monitoring-Process Flows

	Stream ID	Instrument No.	Parameter	Units	S/C	Frequency	Sample Type/ Data Source
1.	Natural Gas	PIT-402	Pressure	IWC	S	Hourly	PCS
		TE-402	Temperature	F	S	Hourly	PCS
		FIT-402	Flow	LB/M	S	Hourly	PCS
2.	Combustion Air	PIT-401	Pressure	IWC	S	Hourly	PCS
		TE-401	Temperature	F	S	Hourly	PCS
		FIT-401	Flow	LB/M	S	Hourly	PCS
3.	Stack Gas	TE-700	Temperature	F	C	Hourly	PCS
		FIT-700	Flow	ACFM	S	Hourly	PCS
			Fugitive Dust PM-10	GR/DSCF	S	Annually	
			Total Fugitive Dust	GR/DSCF	C	Note 1	
			SO_2	PPM	S	Annually	Field Instrument
			NO_x	PPM	S	Annually	Field Instrument
			CO_2	%	S	Annually	Field Instrument
			CO	PPM	S	Annually	Field Instrument
			O_2	%	S	Annually	Field Instrument
4.	Cooling Water Supply	FIR-627	Flow	LB/M	S	Hourly	PCS
		TE-614	Temperature	F	S	Hourly	PCS
			TDS	MG/L	S	Note 2	Grab Sample
			TOC	MG/L	S	Note 2	Grab Sample
5.	Cooling Water Return	FIR-628	Flow	LB/M	S	Hourly	PCS
		TE-604	Temperature	F	S	Hourly	PCS
			TDS	MG/L	S	Note 2	Grab Sample
			TOC	MG/L	S	Note 2	Grab Sample
6.	Raw Coal Inlet	FIR-108	Flow	TON/HR	S	Hourly	PCS
			Proximate[a]		S	Daily	Grab Sample
			Ultimate[b]		S	Note 2	Grab Sample
			Trace Elements[c]		S	Note 2	Grab Sample
		FIT-401	Temperature	F	S	Hourly	Use Combustion Air Inlet Temp
7.	Sodium Bicarbonate		Flow	LB/M	S	Daily	Usage Rate
			Composition – Note 3		S	Monthly	Grab Sample
8.	Binder		Flow	LB/M	S	Daily	Usage Rate
			Composition – Note 4		S	Monthly	Grab Sample
9.	Dried Coal		Flow	TON/HR	S	Monthly	Inventory
			Proximate[a]		S	Daily	Grab Sample
			Ultimate[b]		S	Note 2	Grab Sample
			Trace Elements[c]		S	Note 2	Grab Sample

Table EMP-1 ACCP Stream Monitoring-Process Flows (cont'd)

	Stream ID	Instrument No.	Parameter	Units	S/C	Frequency	Sample Type/ Data Source
10	Cleaned Coal		Flow	TON/HR	S	Monthly	Inventory
			Proximate[a]		S	Daily	Grab Sample
			Ultimate[b]		S	Note 2	Grab Sample
			Trace Elements[c]		S	Note 2	Grab Sample
11.	Process Slack		Flow	TON/HR	S	Monthly	Inventory
			Proximate[a]		S	Daily	Grab Sample
			Ultimate[b]		S	Note 2	Grab Sample
			Trace Elements[c]		S	Note 2	Grab Sample
			TCLP		S	Note 2	Grab Sample
12.	Coal Fines		Flow	TON/HR	S	Monthly	Inventory
			Proximate[a]		S	Daily	Grab Sample
			Ultimate[b]		S	Note 2	Grab Sample
			Trace Elements[c]		S	Note 2	Grab Sample
13.	Product Loadout	FIT-920	Flow	TON/HR	S	As Required	PCS
			Proximate[a]		S	When Loading	Sampler
			Ultimate[b]		S	When Loading	Sampler
			Trace Elements[c]		S	When Loading	Sampler
14.	Coal Cleaning Air Baghouse Note 5		Total Fugitive Dust	GR/DSCF	C	Note 1	EPA Method 5
			Fugitive Dust PM-10	GR/DSCF	S	Annually	EPA Method 5

Notes:

1. Sixty (60) days after attaining full production.
2. Sampling and analysis shall be conducted in triplicate per test condition.
   A new test condition is when two or more plant conditions are varied by more than 20 percent and maintained more than 15 days.
3. Composition for sodium bicarbonate at a minimum includes percent $NaHCO_3$, percent NaCl, and size distribution.
4. Binder type is unknown at this time.
   a. Proximate analysis determines the moisture content, volatile matter, fixed carbon, and ash.
   b. Ultimate analysis determines the amount of carbon, hydrogen, oxygen, nitrogen, and sulfur.
   c. Trace elements include: Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mn, Hg, Ni, Se, Ag, V, Cl, F and P.

Table EMP-2 ACCP Non-Process Monitoring

Stream	Parameter	Units	S/C	Sample Type/Frequency	Date Source
Ambient Air	Total Suspended Particles	UG/M	C	Every six days	
Waste Coal Disposal Area Groundwater	Water Level pH Conductivity Total Organic Carbon Major Cations Major Anions Metals		C C C C C C C	Monthly Every three months Every three months Every three months Every six months Every six months Every six months	

5.1 Air Quality

Atmospheric emissions from the ACCP fall into two categories: 1) particulate from the process and fugitive emissions, and 2) process combustion products. The process particulate emission is predicted to be approximately 83 tons/year, and fugitive particulate emissions are predicted to be approximately 13 tons/year (Ref. 1).

The secondary category of atmospheric emissions is process combustion products. The three classes of compounds of concern are sulfur oxides, nitrogen oxides, and carbon monoxide. Predicated emissions of these compounds are (Ref. 1):

- sulfur oxides (35.5 tons/year);
- nitrogen oxides (34.8 tons/year); and
- carbon monoxide (28.3 tons/year).

Fugitive particulate emissions are controlled with a combination of stabilization and source reductions; a 91-percent reduction from uncontrolled fugitive particulate emissions is predicted. Process particulate emissions are controlled with baghouses; a 99-percent reduction from uncontrolled emissions is predicted (Ref. 1).

A low nitrogen oxide burner will be used in the heat plant, and a 31-percent reduction in nitrogen oxides production is predicted (Ref. 1).

The burner will also be of a special design to limit carbon monoxide production. A 76-percent reduction in carbon monoxide production is predicted (Ref. 1).

5.1.1 Compliance Monitoring

<u>Existing Mine Operations</u>

Currently, the only ambient air quality compliance monitoring at the ACCP Demonstration Facility relates to suspended particulates. The Rosebud SynCoal Partnership currently operates eight sites. Each site has one, High Volume Air Sampler (HVAS) from which total suspended particulate data is collected on a six-day Environmental Protection Agency (EPA) schedule. Sites are located as indicated in Table EMP-3 on the following page.

Table EMP-3 Air Quality Sampling Sites.

Site Number	Location	Coordinates
1A & 1B	Mine Area A by Highway 39	52000 N, 53800 E
9	South of Area B	40750 N, 54700 E
10	North of Area C	51300 N, 24100 E
11	West of Area C	55800 N, 8350 W
12	Southeast of Area D	52600 N, 67400 E
13	South of Area C	38800 N, 12700 E
14	East of Area A	52500 N, 52250 E

ACCP Demonstration Project

In addition to continued suspended particulate monitoring, once operational, a performance test is required after the air quality permit is approved. A performance test is required within 60 days after full production is attained. The test consists of an EPA Method 5 for measuring particulate emissions from the flue gas stack and from the coal cleaning air discharge. The air quality permit also requires monitoring and recording the flue gas temperature.

5.1.2 Supplemental Monitoring

Existing Mine Operations

No supplemental monitoring activities are required to the current mine activity.

ACCP Demonstration Project

Supplemental monitoring for the ACCP Facility is used mainly for determining performance and efficiencies of unit operations and gathering data for scale-up activities and economic evaluations. Supplemental environmental monitoring is not directed toward measuring emissions as much as measuring the process performance and efficiency. The following process measurements are taken: temperature, flow, fugitive dust, sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon dioxide (CO_2), carbon monoxide (CO), and oxygen (O_2). Also, measurements are taken on natural gas pressure at burner tip and combustion air pressure, termperatue, and flow.

Sodium bicarbonate and binder material were to be measured for flow and composition; however, these were never used in the process.

5.2 Water Quality

This ACCP Demonstration Facility is designed to have no aqueous discharges during normal operations; therefore, no specific pollution control is planned for ACCP aqueous discharges. If a water line rupture or other catastrophe occurs, the mine drainage containment plan will allow for any necessary mitigating measures to be performed (Ref. 1).

5.2.1 Compliance Monitoring

Existing Mine Operations

Water quality compliance monitoring at the Rosebud Mine is already extensive. At the end of the 1990 water years, The Rosebud SynCoal Partnership was monitoring a total of 434 groundwater wells. The wells are spread throughout the mine and draw water from various depths and geologic structures. In addition, surface water was monitored at 13 stations (Ref. 1). An example of compliance monitoring reporting is shown in Appendix B.

ACCP Demonstration Project

Additional water quality monitoring affected by solid waste generation is discussed in Section 5.3.

5.2.2 Supplemental Monitoring

Existing Mine Operations

No supplemental monitoring activities are required to the existing mine activity.

ACCP Demonstration Project

Cooling water supply and return is monitored for flow, temperature, total dissolved solids, and total organic carbon.

5.3 Solid Waste Disposal

The amount of solid waste generated is dependent on the type and amount of coal processed and the process conditions. Raw coal inlet, dried coal, cleaned coal, and product loadout are monitored at the ACCP Demonstration Facility to compare with the solid waste generated.

There are currently two sources of solid waste generated at the ACCP Demonstration Facility: the process slack, which is the waste material produced in the cleaning circuit, and the process fines. The ACCP Demonstration Facility will produce approximately 41,000 tons/year of process slack. This material is similar to the top/bottom of seam slack coal normally wasted in the pits during coal removal operations at the Rosebud Mine (Ref. 1). The ACCP Demonstration Facility will also produce approximately 0 to 30,000 tons per year of excess process fines that cannot be sold to off-site customers. Both solid waste streams are disposed in mine pits; however, different techniques are used.

5.3.1 Compliance Monitoring

Existing Mine Operations

No supplemental monitoring activities are required to the existing mine activity.

ACCP Demonstration Project

Process Slack

The original plan for disposing of the process slack was to blend the slack with the top layer of seam coal being supplied to off-site customers when possible. However, when this disposal method is unavailable, The Rosebud SynCoal Partnership's secondary disposal plan allows the process slack to be placed in operating pits for burial as an alternate disposal method. As is currently done with top/bottom seam slack coal generated during normal mining activities, the process slack coal from the ACCP Facility is placed at the bottom of mined-out portions of the Rosebud seam in areas where it will be located below the predicted post-mine water table and where backfilling with spoil will occur within a six-month period. This method provides for burial with a minimum of 10 feet non-toxic, non-combustible material and ensures the pyritic component of the slack coal remains in a reduced or non-acid-forming state (Ref. 2). Laboratory analyses were done for pH, sulfur fractionation, and acid-base potential to ensure disposal methods would not adversely affect the environment. Results are discussed in Sections 6.3.

In March 1994, due to continued problems with spontaneous combustion of the slack, the permit was revised to include a new on-site slack disposal method. The new method involved placing the ACCP process slack in front of the dragline or on the bench behind the dragline. The dragline mixes the process slack with overburden material during the normal dig cycle then spoils the combined mixture at the bottom of the spoil zone or pit.

Groundwater quality, including pH, conductivity, total organic carbon, major cations, major anions, metals, and water levels in on-going around process slack disposal areas.

Process Fines

Until January 1993, the SynCoal® fines were going to be pelletized for commercial use. Unfortunately, this process was not accomplished because production and facility development had to be completed before work with another major piece of equipment--the briquetter-- could begin. The briquetter required too much time and expense during critical production development.

In June 1993, the fines conveying handling system was replaced with drag conveyors and a bulk fines handling system. This enabled the process fines to be disposed of by either of two options:

off-site sales to customers or site pit disposal using a slurry system when off-site sales lag production.

Water samples are taken from the process fines pit pond on a quarterly basis and are analyzed for pH, conductivity, total organic carbon, major cations, major anions, and metals.

5.3.2 Supplemental Monitoring

Existing Mine Operations

No additional supplemental monitoring activities are required to the current mine activity.

ACCP Demonstration Project

Process Slack
Flow, proximate and ultimate analysis and analysis of trace elements are monitored. Ultimate analysis determines the amount of carbon, hydrogen, oxygen, nitrogen, and sulfur. Proximate analysis determines the moisture content, volatile matter, fixed carbon, and ash. Trace elements include Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mn, Hg, Ni, Se, Ag, V, Cl, F, and P.

Process Fines
Flow, proximate and ultimate analysis and analysis of trace elements are monitored.

5.4 Health and Safety

The existing mine operations are required to meet Mine Safety and Health Administration (MSHA) requirements. These requirements follow the Code of Federal Regulations (CFR) monitoring requirements.

5.4.1 Compliance Monitoring

Existing Mine Operations

Noise: Existing mine operations working environment compliance monitoring is performed per 30 CFR Part 71. Personal noise levels are measured as necessary by a qualified individual. A Hearing Conservation Program for the coal drilling job classification is in place. Periodic noise surveys are performed per 30 CFR 71.803.

Dust: Monitoring and control of dust are conducted according to 30 CFR 71.100 through 71.301. At this time there are no MSHA-designated work positions that require sampling.

Methane: Tests for methane by a qualified person using an approved device are conducted as specified in 30 CFR Part 787.201-1. Additionally, continuous methane monitoring is in effect at the Area C crusher/conveyor facility.

ACCP Demonstration Project

Health and safety compliance monitoring for noise and dust will continue on the same basis as existing mine monitoring activities. The Rosebud SynCoal Partnership has installed continuous methane monitors in the ACCP infeed pit and under the ACCP storage silos.

5.4.2 Supplemental Monitoring

Existing Mine Operations:

Noise: Periodic or spot check measurements are made when requested by employees, as machines are added or modified, during special repair or maintenance projects, during construction, or as necessary for information or fact gathering projects. Personal decimeters or hand-held sound level meters may be used to measure noise.

All new employees are given base-line audiograms. Coal drillers; dragline, shovel, and highwall drill operators; and any other employee showing a shift in hearing ability or those who are exposed to noise levels that approach allowable limits are also given annual audiograms.

Dust: Areas where dust is a concern are sampled as needed, and private labs are used for analysis. Dust sampling is conducted for the benefit of the employee and the company even though MSHA may not have active designated work positions assigned.

Methane and other gases: Tests are on-going as needed to ensure the personal health and safety of employees. All front line supervisors have been trained to an instructor level for detection of mine gases.

Bins and tanks are tested for oxygen and explosive gases before work or entry.

Lower explosive limit readings of explosive gases must be 0.00 before welding on or repairing fuel tanks.

Possible hazardous vapors are tested for as needed by using MSHA instruments, Including MX251, MX250, and CO262.

ACCP Demonstration Project

A mass spectrometer, a CO monitor, and a sample handling system have been installed for process and storage vessel dry gas monitoring. These monitors are capable of measuring the concentration of all non-condensable gas species to within approximately +/- 0.1 percent and are used mainly to gauge process stability and safety and to help manage safe storage of the SynCoal® product.

5.5 Ecological Impacts

WECo's Wildlife Monitoring Plan is designed for big game, small mammals, upland game, raptors, and song birds. All surveys for the Plan were conducted by a professional wildlife biologist with a sound understanding of the wildlife species inhabiting the area. The investigator was also able to properly observe and identify the various wildlife species.

Reclamation habitat types are intended to replace pre-mine habitats; therefore, reclamation types to be sampled included grassland, big sagebrush grassland, silver sagebrush grassland, skunkbush sumac grassland, ponderosa pine grassland, and mixed shrub (thin breaks).

5.5.1 Compliance Monitoring

Existing Mine Operations

The monitoring requirements for big game included production and herd composition and winter distribution. The majority of the information was obtained from aerial surveys, which also provided trend data, number of animals observed/hour of aerial survey, and minimum population estimates.

Small mammal trapping grids were established on the subset of the song bird plots. One grid was placed in each of the major reclaimed habitat types, as well as in each of the major native reference areas. The grids were supplied by WECo and approved by MDSL.

Population trends were also determined for upland game species. Aerial surveys of prominent outcrops and timbered habitats were completed for the raptors to determine the status of known eyries and to locate additional nesting sites. The ariel surveys were followed by on-the-ground verification of species to determine production on as many nests as possible. For the song bird species, five variable circular plots of the major reclaimed habitat types and respective major native reference types were randomly established.

ACCP Demonstration Project

No additional compliance monitoring activities are required to the ACCP Facility.

5.5.2 Supplemental Monitoring

Existing Mine Operations

No additional supplemental monitoring activities are required to the current mine activities.

ACCP Demonstration Project

No additional supplemental monitoring activities are required to the ACCP Facility.

6.0 Actual Environmental Monitoring (Historical Timeline)

The environmental monitoring results for the ACCP Demonstration Facility are categorized according to air quality, water quality, solid waste disposal, health and safety, and ecological impacts. These main categories are then further divided into compliance monitoring and supplemental monitoring where the actual results are presented and discussed.

Figure EMR-1 shows the overall locations for the various monitoring activities as they relate to the actual site layout and location of the ACCP Demonstration Facility. These sites are identified again as each environmental topic is discussed.

All tables and Figure s showing results are at the end of each sub-section. They are compared on a historical timeline to show the environmental results prior to constructing the ACCP Demonstration Facility with the environmental results during operation of the facility through July 1995. No supplemental monitoring data is presented for the time frame of Prior to Construction and Construction and Start-up since the supplemental monitoring relates to process parameters and they would not have been operational during those periods.

Two additional areas that were to be monitored were sodium bicarbonate and binder flow and composition. The sodium bicarbonate was to be used for SO_2 reduction. The binder was to be used for briquetting. Neither system was ever used and therefore no data was available.

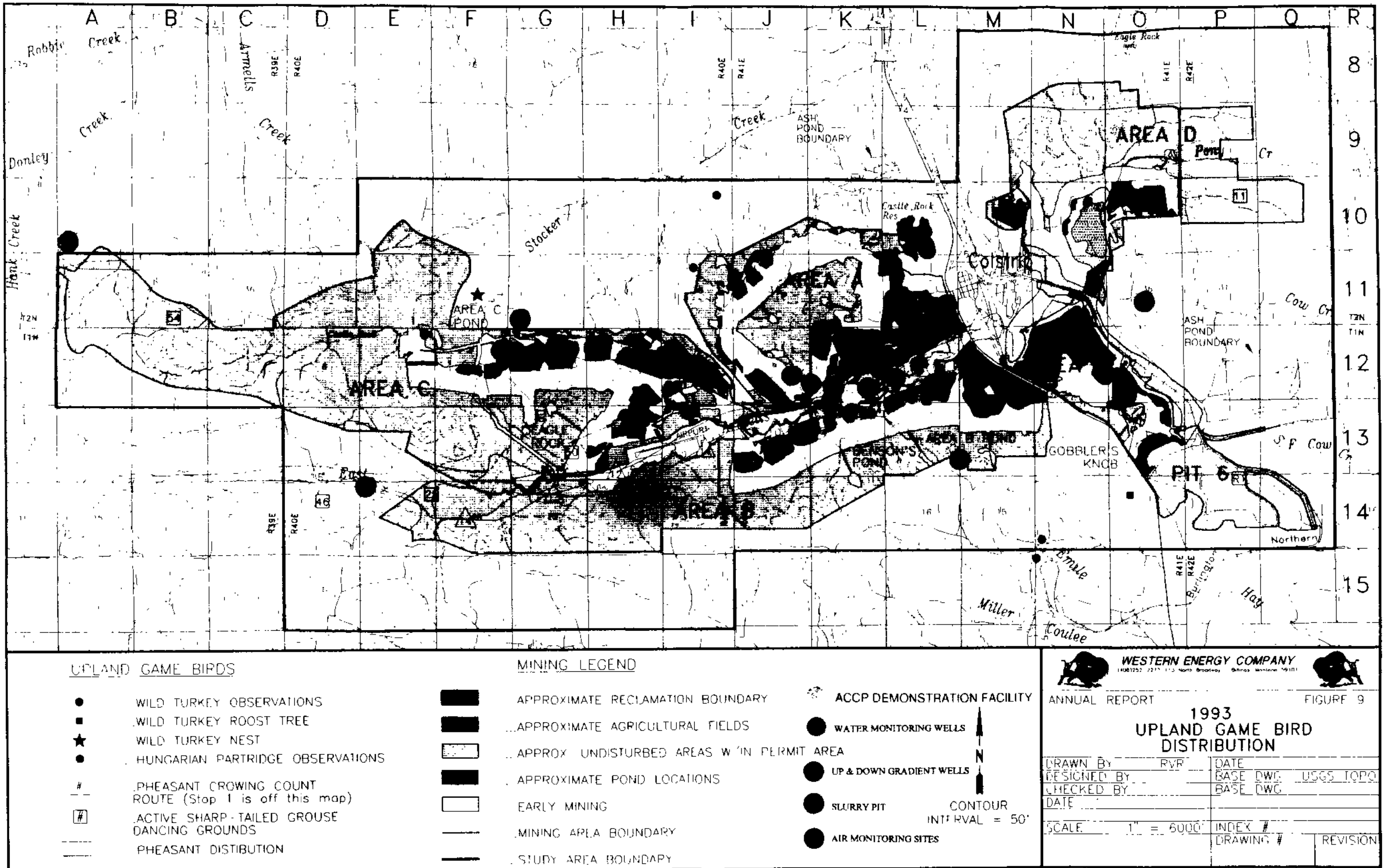


Figure EMR-1. Major Monitoring Locations

6.1 Air Quality

Possible environmental impacts to air quality from the ACCP Demonstration Facility are from two types of emissions: (1) particulate from the process and fugitive emissions; and (2) process combustion products.

Compliance monitoring involves sampling and monitoring total suspended particulate and stack emissions. Supplemental monitoring includes monitoring combustion and makegas pressures, temperatures and flows, and stack-gas temperature and flow.

6.1.1 Compliance Monitoring

6.1.1.1 Total Suspended Particulate/PM_{10}

Since the beginning of WECo's air monitoring program, total suspended particulate (TSP) data has been collected. The Montana TSP standard is 200 micrograms per cubic meter for the 24-hour period and 75 micrograms per cubic meter for the annual average. On April 30, 1992, WECo stopped collecting TSP data, and on May 12, 1992, all samplers began collecting PM_{10} data according to the Montana and Federal ambient particulate standards, which is 50 micrograms per cubic meter. The 24-hour PM10 particulate standard is 150 micrograms per cubic meter. All samples are collected on a six day EPA schedule except for Site 14 which is run on a 3-day schedule when the dragline is in the northeast quarter section of Section 32. Monitoring sites are located as indicated below and shown in Figure AIR-1.

Sites:

1A & 1B:	Mine Area A by Highway 39.
9:	South of Area B.
10:	North of Area C.
11:	West of Area C.
12:	Southeast of Area D.
13:	South of Area C.
14:	East of Area A.

The highest reported value, the second highest reported value, and the arithmetic mean for each sampling location according to the project timeline are shown in Table AIR-1.

Prior to Construction (Prior to December 1990)
Figure AIR-2 shows the highest reported value, the second highest reported value, and the arithmetic mean of the seven sampling locations for 1990 (Prior to Construction). The graph also shows the 24-hour standard and the annual average standard. The annual average TSP concentrations at all sites were within the standards.

Construction and Start-up (December 1990 - May 1992)
Figure AIR-3 shows the highest reported value, the second highest reported value, and the arithmetic mean of the seven sampling locations during Construction and Start-up. The graph also shows the 24-hour standard and the annual average standard. There were no significant TSP increases attributable to construction of the facility. However, there were significant TSP increases at sites 1A and 1B as a result of topsoil stripping and trenching for gas and water lines laid immediately adjacent to the site to which were to serve the coal dryer. Also during the Third Quarter of 1991, the county opened a scoria pit Northwest of Site 11, which increased TSP readings at this site. On April 18, 1992, WECo samplers recorded abnormally high readings. A check with MPC, Rosebud Energy, and the Peabody Big Sky Mine showed elevated TSP readings were common in the area due to low humidity and a 20 to 28 mile per hour average wind. During the Second Quarter of 1992, WECo applied 391 tons of dust suppressant to permanent haul roads and facility roads to reduce fugitive dust.

Extended Start-up (May 1992 - August 1993)
Figure AIR-4 shows the highest reported value, the second highest reported value, and the arithmetic mean of the seven sampling locations during Extended Start-up. The graph also shows the 24-hour standard and the annual average standard. The annual average TSP concentrations at all sites were within the standards.

Demonstration Operation (August 1993 - ongoing)
Figure AIR-5 shows the highest reported value, the second highest reported value, and the arithmetic mean of the seven sampling locations during Demonstration Operation. The graph also shows the 24-hour standard and the average annual average standard. The annual average TSP concentrations at all sites were within the standards. During the Third Quarter of 1993, an explosive storage facility was constructed. This facility is located approximately 1/4 mile east of Site 10. A scoria access road to the facility is used daily by heavy truck traffic.

During the Fourth Quarter of 1993, WECo experimented with a new road stabilizer trade named EN-1. One and one-half miles of haul road in selected areas were loosened with an asphalt reclaimer to a depth of six inches. EN-1 was then mixed with the loosened soil. After surface shaping with a blade, the surface was compacted with a roller. The EN-1 stabilizer test was considered a technological success. The treated road remained relatively dust free up to 18 months after treatment.

6.1.1.2 Particulate Emissions Testing from ACCP Emission Standards:

The following emission limits are stated in Montana Air Quality Bureau (MAQB) Permit #1483E:

1. Particulate stack emissions from the thermal dryers (fluid bed reactors) are limited to 0.031 gr./dscf or 0.070 grams per dry standard cubic meter (g/dscm). Since the clean airflow from the two baghouses on the dryers is returned to the process heater, the emission testing point shall follow at the exhaust of the process heater baghouse (first-stage drying gas stack).

2. Particulate stack emissions from pneumatic coal cleaning equipment (product cleaning) are limited to 0.018 gr./dscf or 0.40 g/dscm (Baghouse D-8-56).

Extended Start-up (May 1992 - August 1993)

MPC's Colstrip Project Division, Environmental Engineering Department, conducted particulate matter emissions tests for the Rosebud SynCoal Partnership's ACCP Demonstration Plant on April 26 and 27, and May 3, 1993. Sampling was performed on the first-stage process gas stack and on the two outlets of Baghouse D-8-56. This testing was done to fulfill ACCP compliance test obligations as outlined in the MAQB's Permit #1483E and subsequent written agreements between Rosebud SynCoal Partnership and the MAQB.

MPC's Environmental Engineering Department also conducted test procedures per 40 CFR 60, Reference Methods (RM) 1-5, as amended on May 25, 1983. Additionally, the Texas Air Control Board (TACB) method for particulate sampling in cyclonic flow conditions was used on the first-stage process gas stack. All sampling was performed from the stack and outlet ports as described in Pre-Test Reports.

First-Stage Drying Gas Baghouse Stack: One test series was completed on April 26, 1993, using the TACB cyclonic flow sampling procedure. Pre- and post-test velocity profile traverses were performed to confirm the presence of the non-axial flow in the stack. A visual observation of opacity (Method 9) of 10.2 percent was made. Orsat analyses and moisture tests were done and used to calculate the molecular weight as outlined in the multi-point integrated bag version of Method 3. The ACCP raw coal feed rate was approximately 27.1 tons/hour (45 percent of maximum) during the test day.

Particulate emissions on the first-stage process gas baghouse stack averaged 0.0158 gr./dscf, which equals 51 percent of the 0.031 gr./dscf limit.

Baghouse D-8-56 East and West Outlet Ducts: Sampling equipment setup, a preliminary moisture test, and velocity traverses were performed the morning of April 27, 1993. The first run of the particulate test series on the east outlet duct was also conducted. However, due to an unplanned outage, the remaining two test series on the east outlet duct were completed on May 3, 1993. The raw coal feed rate averaged 26.7 tons/hour (44.5 percent of maximum) for the test series.

Sampling on the west outlet duct of Baghouse D-8-56 was completed on May 3, 1993. The facility raw coal feed rate averaged 30.7 tons/hour (51.2 percent of maximum).

Particulate emissions from the east outlet duct of Baghouse D-8-56 averaged 0.0013 gr./dscf. The west outlet duct, which was the worst case of the two outlet ducts, registered average particulate emissions of 0.0027 gr./dscf or 15 percent of the limit in MAQB Permit #1483E.

Demonstration Operation (August 1993 - ongoing)

Stack Emissions Testing: During the 1993 sampling, particulate emissions from the thermal stack averaged 0.0158 gr./dscf or 51 percent of the 0.031 gr./dscf limit. Additional stack testing was completed on May 18, 1994 to determine the rate of discharge of carbon monoxide, sulfur dioxide, and particulate, and nitrogen oxides from the process stack. Table AIR-2 summarizes the stack testing results and compares the actual emission rates to the predicted and allowable rates. The results indicate that the assumptions in which the ACCP air quality permit was based on were valid. That is, no gaseous pollutant discharge rates were greater than 100 tons per year. The testing also confirmed the particulate emissions are below the permit level. The raw coal feed rate averaged 65 tons per hour rather than the design rate of 68 tons per hour for the test series.

As indicated in Table AIR-2, the carbon monoxide emission rate is higher than predicted. The elevated discharge rate is probably the combined results of high inlet temperatures to the first-stage dryers and low oxygen levels in the furnace. The project modifications scheduled for the 1995 outage will address the high gas temperatures; however, the low oxygen levels will not be corrected at this time.

6.1.2 Supplemental Monitoring

As mentioned in Section 2.0, the coal is heated by direct contact with hot combustion gases mixed with recirculated dryer makegas, removing primarily surface water from the coal. The coal exits the first stage dryer/reactor and is then gravity-fed to the second stage thermal reactors, which further heats the coal using a recirculated gas stream.

The process performance and efficiency parameters that were analyzed in addition to the required parameters include the following:

- natural gas (pressure, temperature, flow);
- combustion air (pressure, temperature, and flow); and
- stack gas (temperature and flow).

The flow rate, pressure, and temperature of the combustion gases and recirculated makegas affect air quality because they affect the efficiency of the process. If the system is operating properly, fewer fines are created that release into the air. In addition, the composition of the gas is affected by operation of the dryers and temperature of the stack gas. If operated properly, air quality impacts will be minimized.

The data for natural gas temperature, stack gas flow, and combustion flow is not reported due to suspect data. The data is suspect due to ineffective calibration requirements and instrument plugging with coal dust and fines. All other data is available.

Extended Start-up (May 1992 - August 1993)
Table AIR-3 shows the average data for combustion air pressure and temperature, natural gas flow and pressure, and stack temperature during Extended Start-up. This data is assessed on a natural gas flow rate of 10 lb./min or greater.

Combustion air pressure remained consistent but temperature was more variable. Combustion air temperatures started high and were adjusted throughout Extended Start-up to optimize overall Facility Performance. Natural gas flow rates and pressures were fairly constant although lower than design to obtain preliminary operating data. Stack gas temperatures remained fairly constant and were adequate to maintain air quality.

Demonstration Operation (August 1993 - ongoing)
Table AIR-4 shows the average data for combustion air: pressure and temperature, natural gas flow and pressure, and stack temperature during Demonstration Operation. This data is based on a natural gas flow rate of 10 lb./min. or greater.

Combustion air pressure remained consistent but temperature slightly more variable. However, both are comparable to the results in Extended Start-up. Natural gas flow rates and pressures were increased continuously throughout the Demonstration Operation to reach design conditions and to obtain maximum performance. Stack gas temperature dropped slightly indicating better process performance.

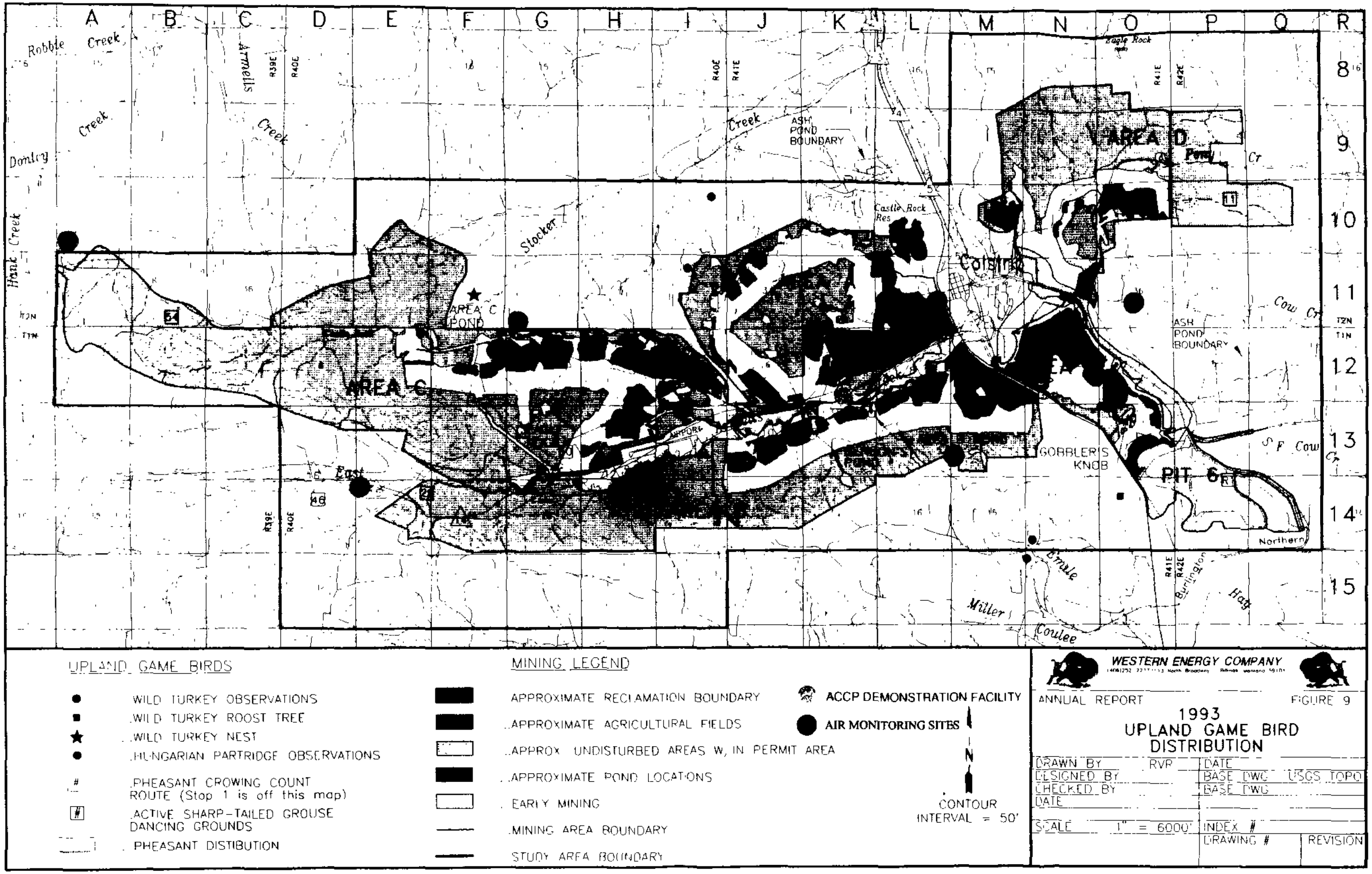


Figure Air -1. Air Monitoring Sites

[redacted]

Table AIR-1. Air Quality Monitoring Results Arithmetic Mean Calculations

4.1 PRIOR TO CONSTRUCTION	PRIOR TO DEC 1990	JAN 1989 – DEC 1989	JAN 1989 – DEC 1989	JAN 1989 – DEC 1989
		MAX	SECOND HIGH	MEAN
TSP DATA	1A	145	132	45.8
	1B	131	127	44.8
	9	257	256	54.8
	10	101	98	23.8
	11	342	241	48.8
	12	83	77	24.8
	13	169	181	25.8
	14	141	129	33.8

4.2 CONSTRUCTION AND STARTUP	DEC 1990 – APR 1992	1ST QRT – 1991	1ST QRT – 1991	1ST QRT – 1991	2ND QRT – 1991	2ND QRT – 1991	2ND QRT – 1991	3RD QRT – 1991	3RD QRT – 1991	3RD QRT – 1991
		MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN
TSP AND PM-10 DATA	1A	48	38	30.0	ND	ND	ND	385*	119*	115.8
	1B	124	77	40.8	71	88	30.8	570*	123*	88.0
	9	34	27	17.0	44	36	23.0	64	32	30.0
	10	101	95	33.0	191	182	38.8	280	168	57.0
	11	124	18	21.8	61	51	22.8	78	61	32.0
	12				51	42	23.8	141	161	41.0
	13	23	21	12.8	37	27	18.8	52	48	30.0
	14	45	28	20.0	53	42	22.8	88	88	34.0

4.2 CONSTRUCTION AND STARTUP	DEC 1990 – APR 1992	4TH QTR – 1991	4TH QTR – 1991	4TH QTR – 1991	1ST QRT – 1992	1ST QRT – 1992	1ST QRT – 1992
		MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN
TSP AND PM-10 DATA	1A	148*	120*	58.8	145	119	58.8
	1B	168*	138*	54.0	161	118	66.0
	9	38	29	16.0	51	35	21.0
	10	184	82	33.6	207	77	49.0
	11	367*	137*	72.8	79	58	31.8
	12	184	89	38.6	131	180	50.8
	13	36	18	12.8	35	30	15.0
	14	147	74	47.8	182	127	68.8

4.4 EXTENDED STARTUP	MAY 1992 – JUL 1993	2ND QRT – 1992	2ND QRT – 1992	2ND QRT – 1992	3RD QRT – 1992	3RD QRT – 1992	3RD QRT – 1992	4TH QTR – 1992	4TH QTR – 1992	4TH QTR – 1992
		MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN
PM-10 DATA	1A	34	23	16.8	21	20	11.5	19	17	11.8
	1B	35	23	16.8	22	20	11.6	19	18	11.9
	9	14	13	10.8	14	11	6.4	11	7	7.2
	10	41	27	16.8	29	21	12.8	38	27	14.8
	11	15	14	10.8	21	19	9.7	16	15	8.2
	12	38	15	14.8	29	19	10.7	28	11	8.8
	13	14	12	9.8	12	11	7.7	13	7	6.8
	14	19	14	11.8	21	14	9.8	14	12	9.7

4.4 EXTENDED STARTUP	MAY 1992 – JUL 1993	1ST QRT – 1993	1ST QRT – 1993	1ST QRT – 1993	2ND QRT – 1993	2ND QRT – 1993	2ND QRT – 1993
		MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN
PM-10 DATA	1A	36	23	13.3	19	17	9.6
	1B	37	24	13.6	17	9	8.6
	9	9	9	5.5	10	9	5.8
	10	16	13	7.5	18	15	8.6
	11	9	8	4.8	10	0	3.8
	12	11	9	6.6	11	10	6.6
	13	9	6	4.5	11	9	3.6
	14	20	17	9.4	13	9	7.2

4.5 DEMONSTRATION OPERATION	AUG 1993 – ONGOING	3RD QRT – 1993	3RD QRT – 1993	3RD QRT – 1993	4TH QTR – 1993	4TH QTR – 1993	4TH QTR – 1993
		MAX	SECOND HIGH	MEAN	MAX	SECOND HIGH	MEAN
	1A	28	16	12.4	23	22	9.8
	1B	17	28	10.8	25	21	10.3
	9	13	9	6.3	9	6	4.9
	10	27	26	12.5	9	7	5.7
	11	13	12	9.5	22	9	4.8
	12	14	13	8.7	28	13	10.7
	13	14	11	7.6	9	5	3.6
	14	14	13	6.9	16	12	6.6

Figure AIR-2. Air Quality Monitoring Prior to Construction - TSP Data

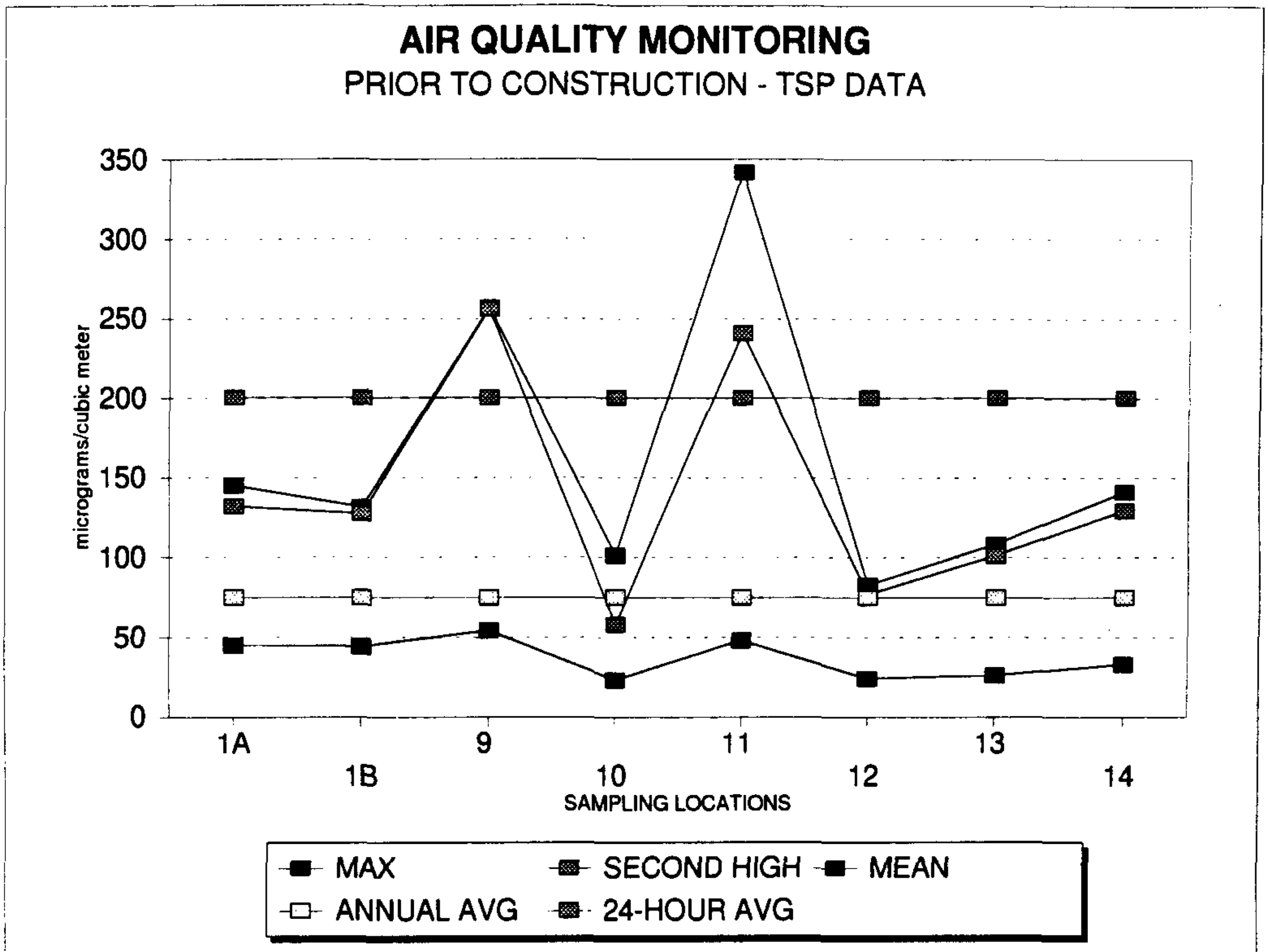


Figure AIR-3(a). Air Quality Monitoring During Construction and Start-Up
(First Quarter - 1991)

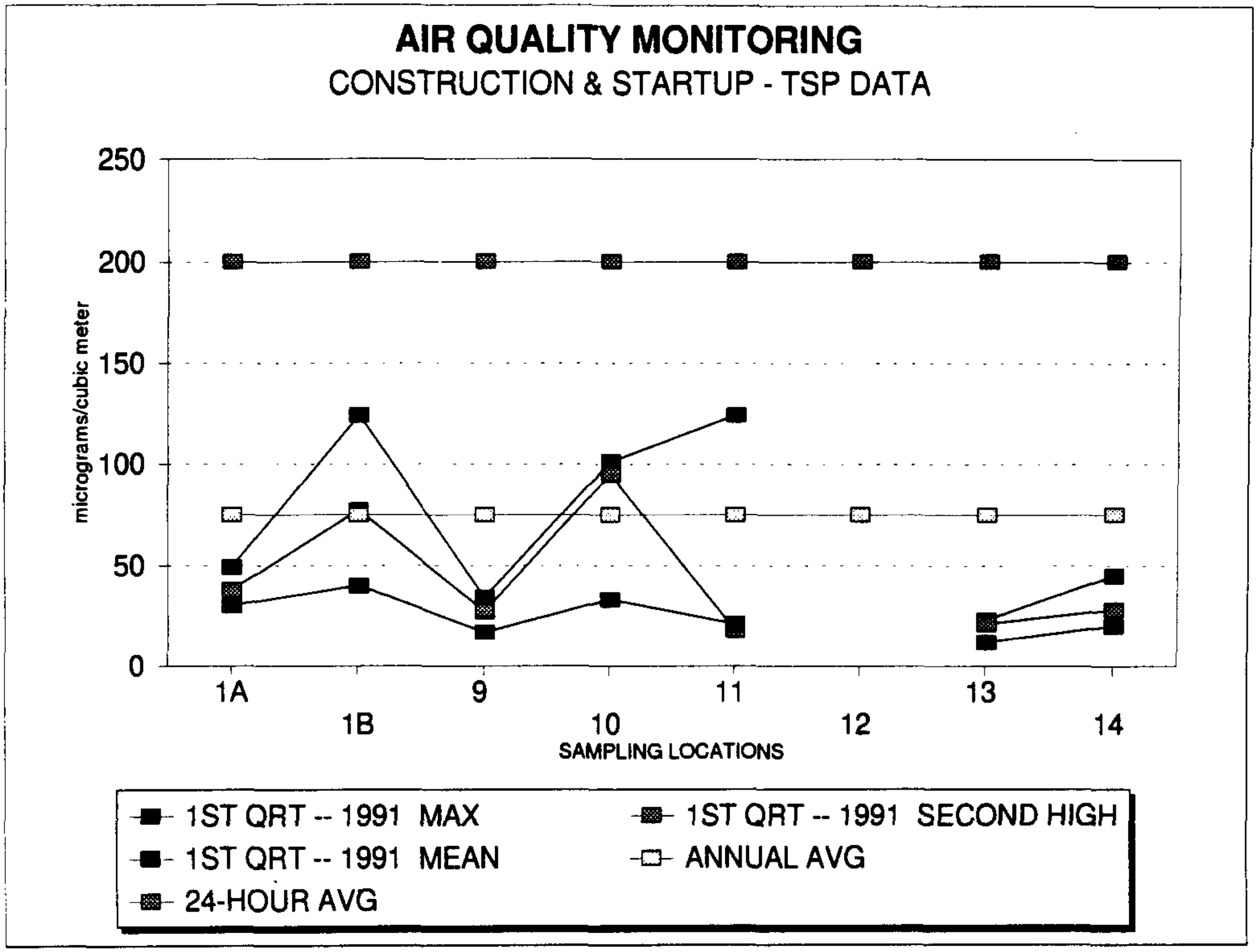


Figure AIR-3(b). Air Quality Monitoring During Construction and Start-Up (Second Quarter - 1991)

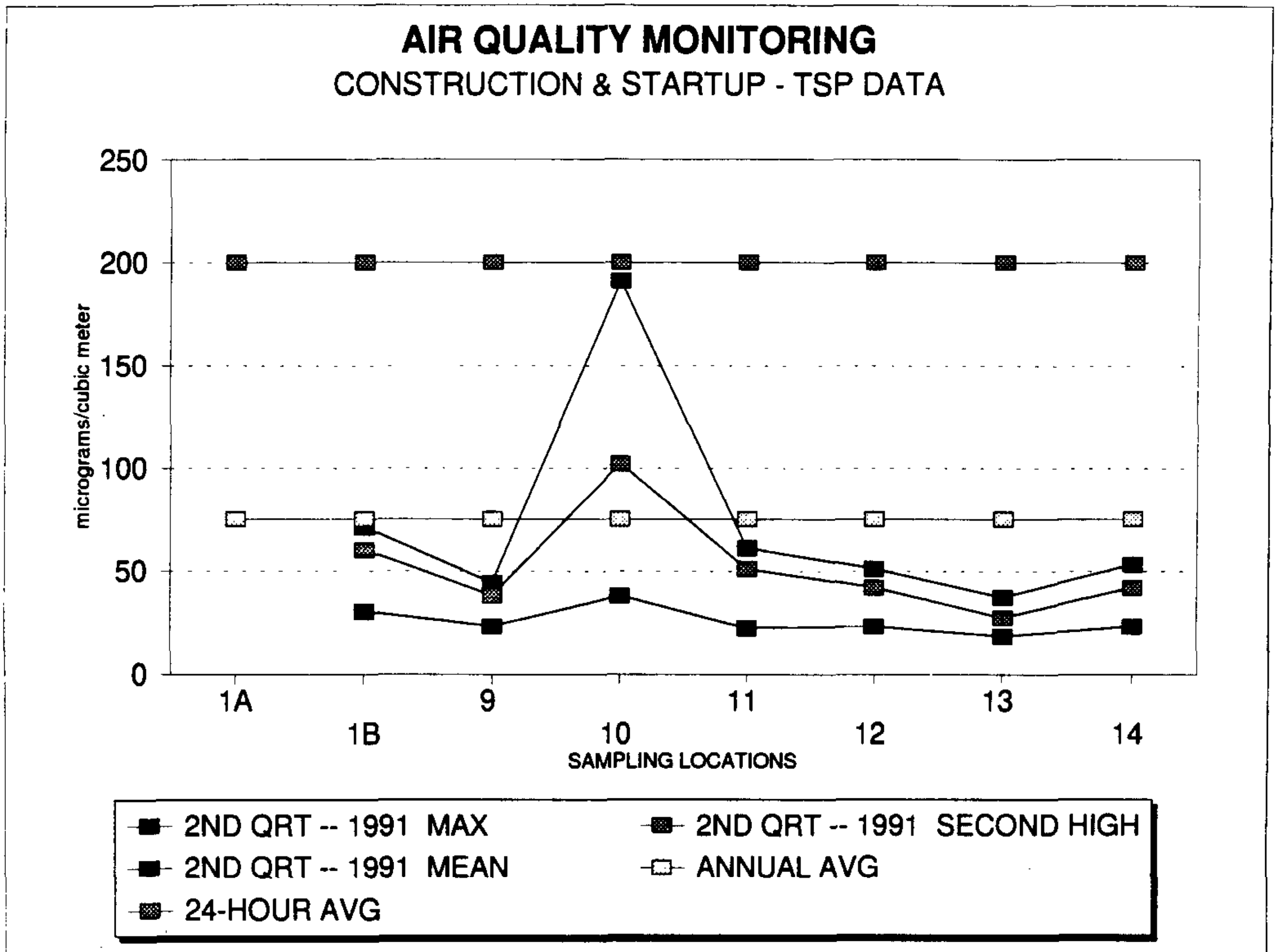


Figure AIR-3(c). Air Quality Monitoring During Construction and Start-Up
(Third Quarter - 1991)

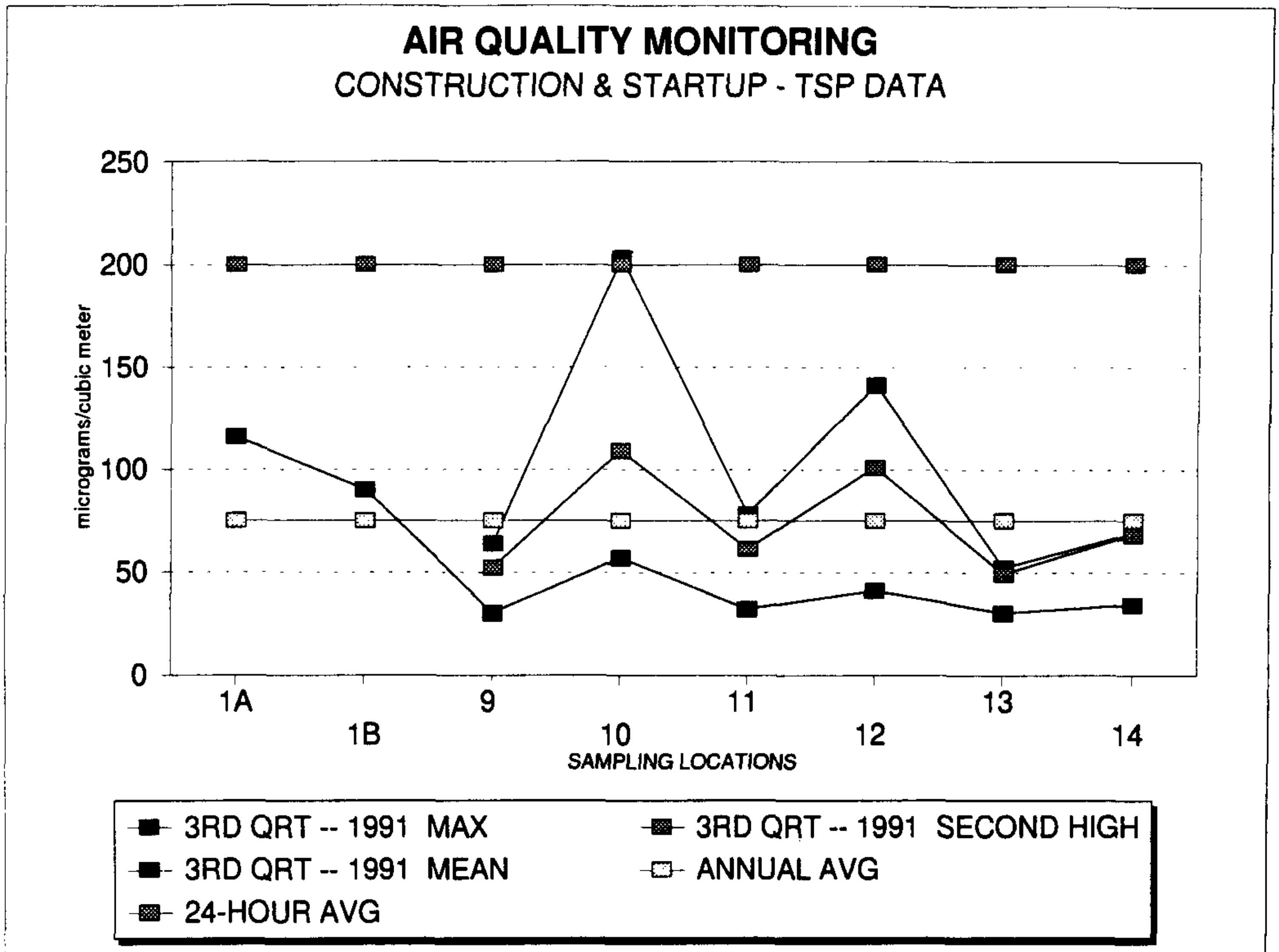


Figure AIR-3(d). Air Quality Monitoring During Construction and Start-Up (Fourth Quarter - 1991)

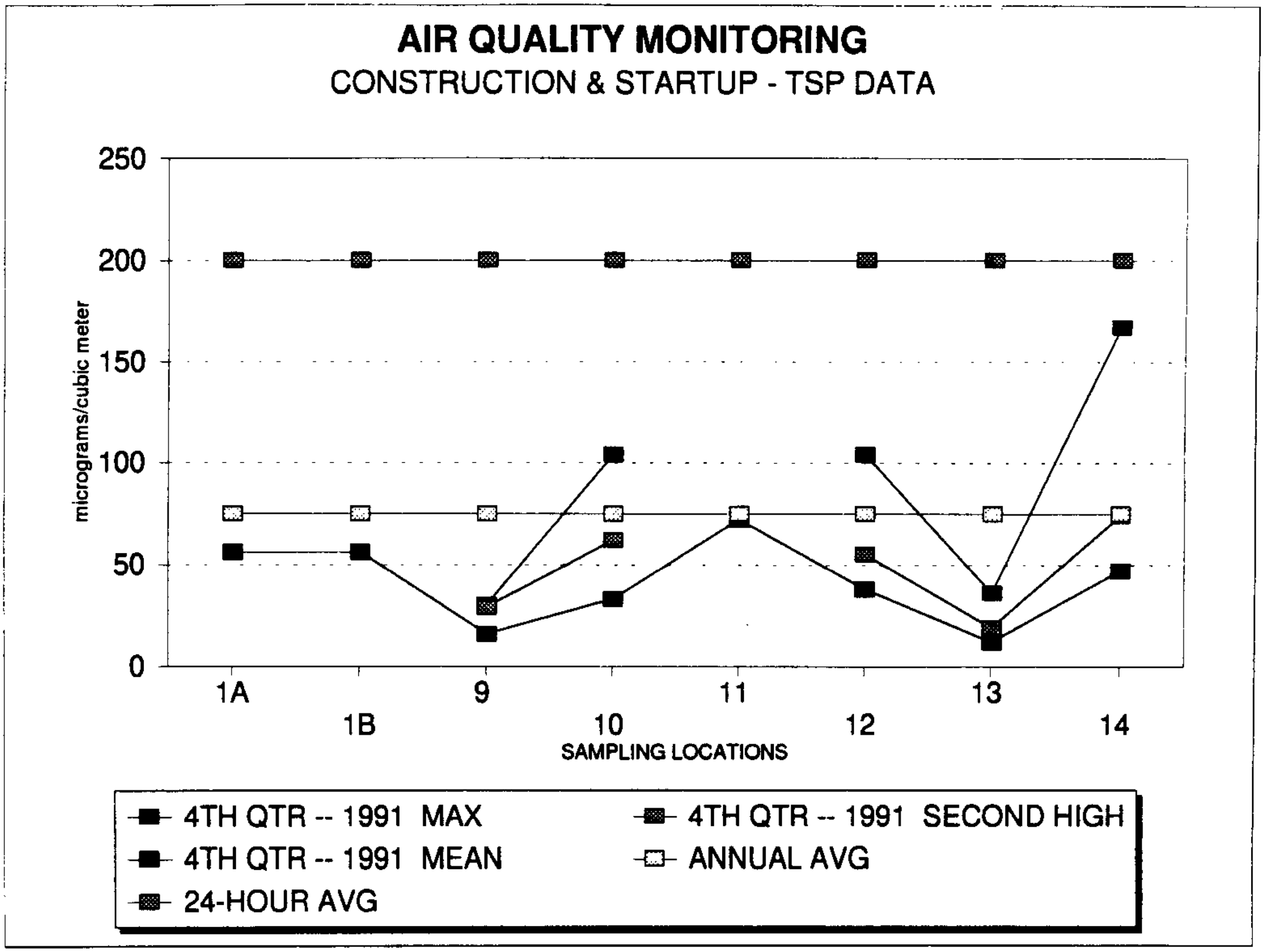


Figure AIR-3(e). Air Quality Monitoring During Construction and Start-Up (First Quarter - 1992)

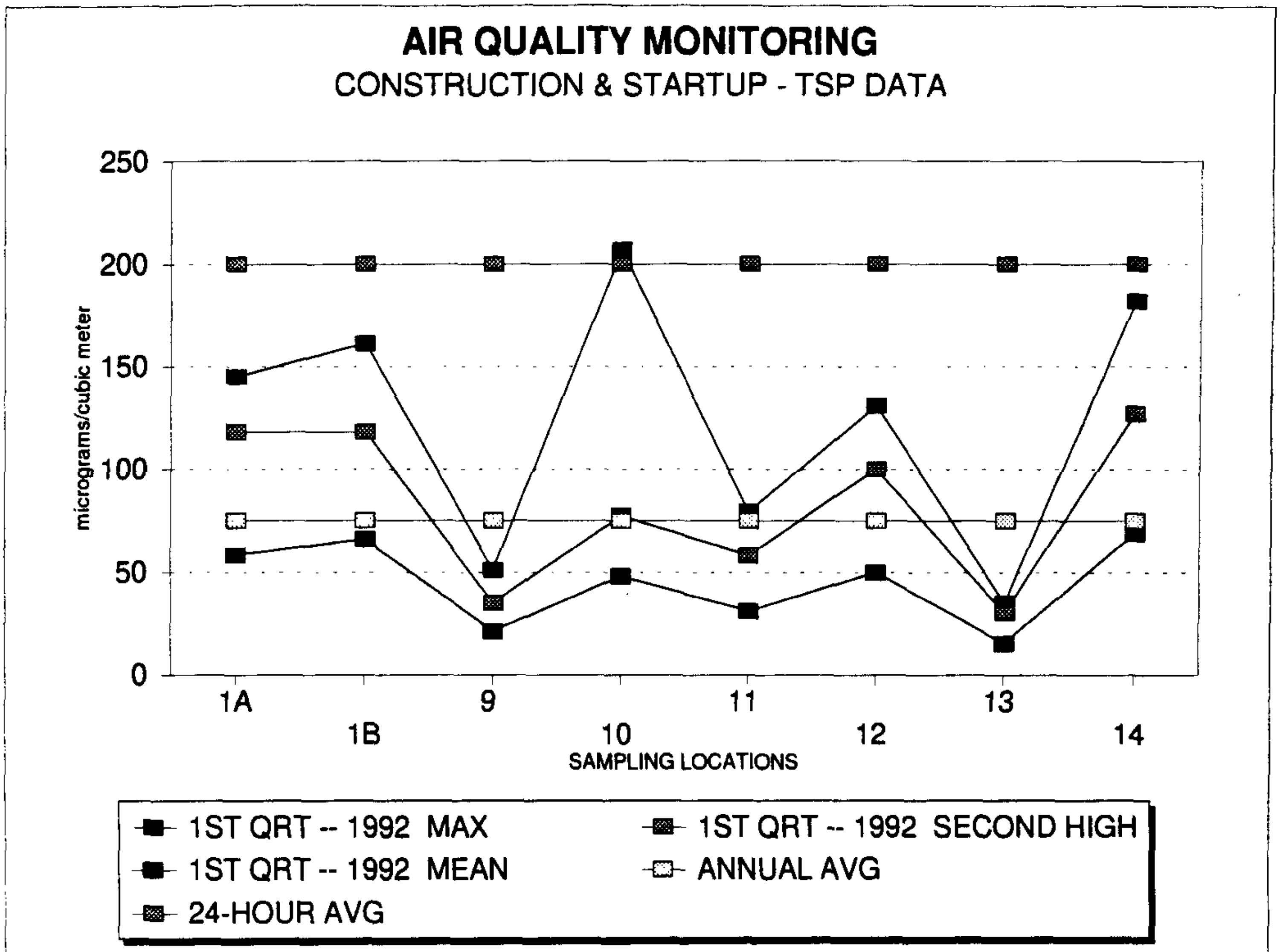


Figure AIR -4 (a). Air Quality Monitoring During Extended Start-Up PM_{10} Data (Second Quarter -1992)

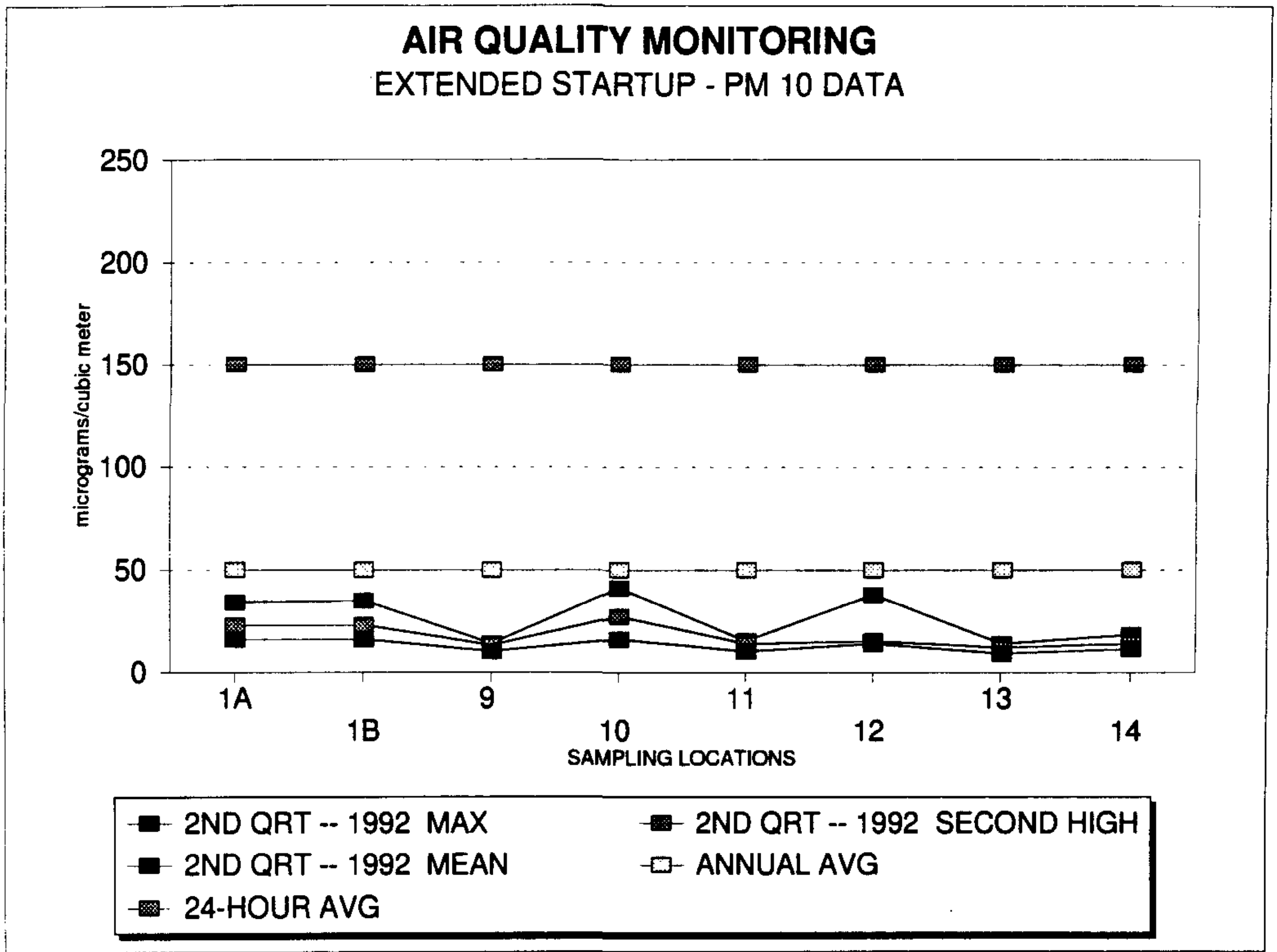


Figure AIR -4 (b). Air Quality Monitoring During Extended Start-Up PM_{10} Data (Third Quarter -1992)

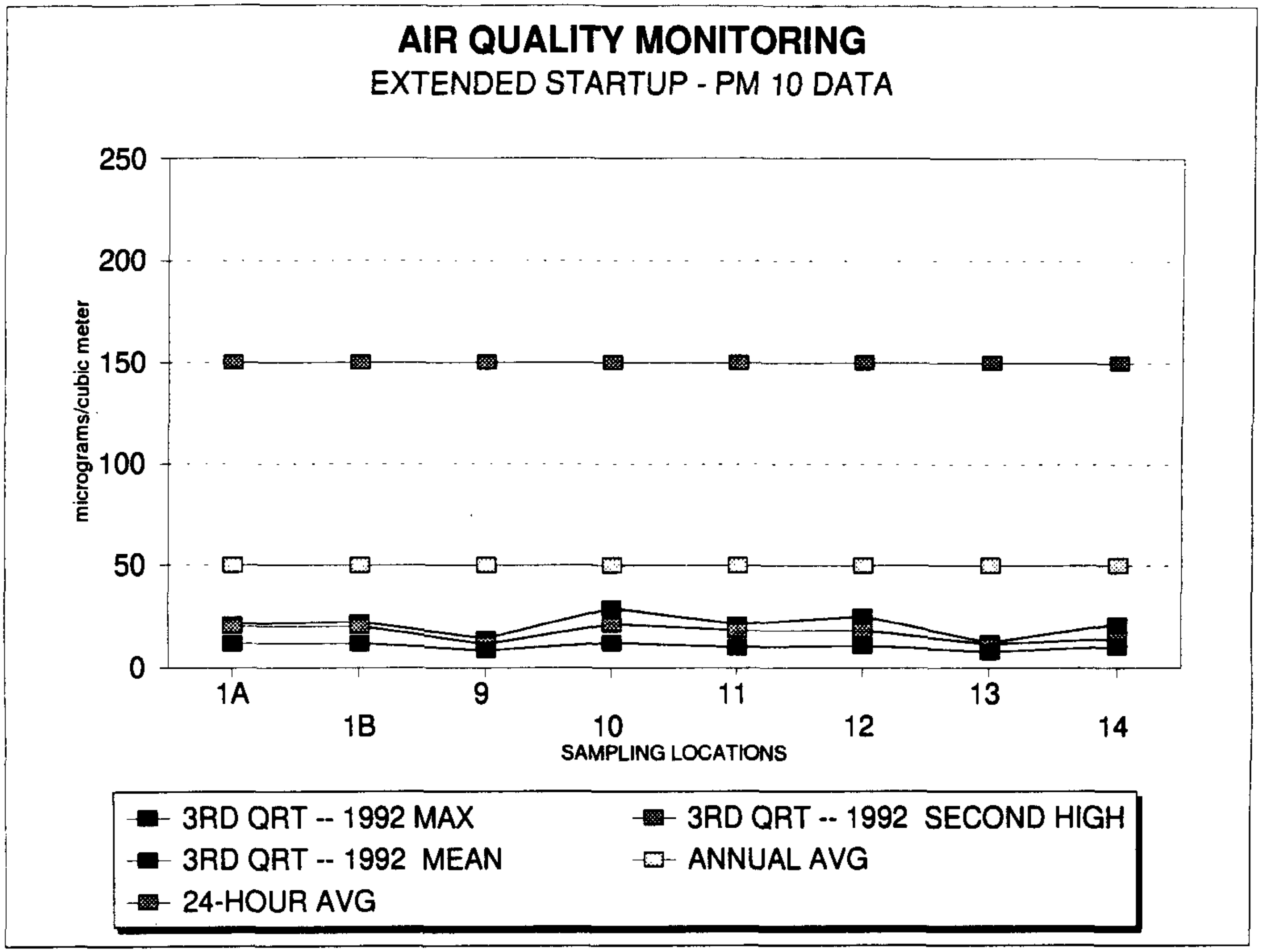


Figure AIR -4 (c). Air Quality Monitoring During Extended Start-Up PM_{10} Data (Fourth Quarter -1992)

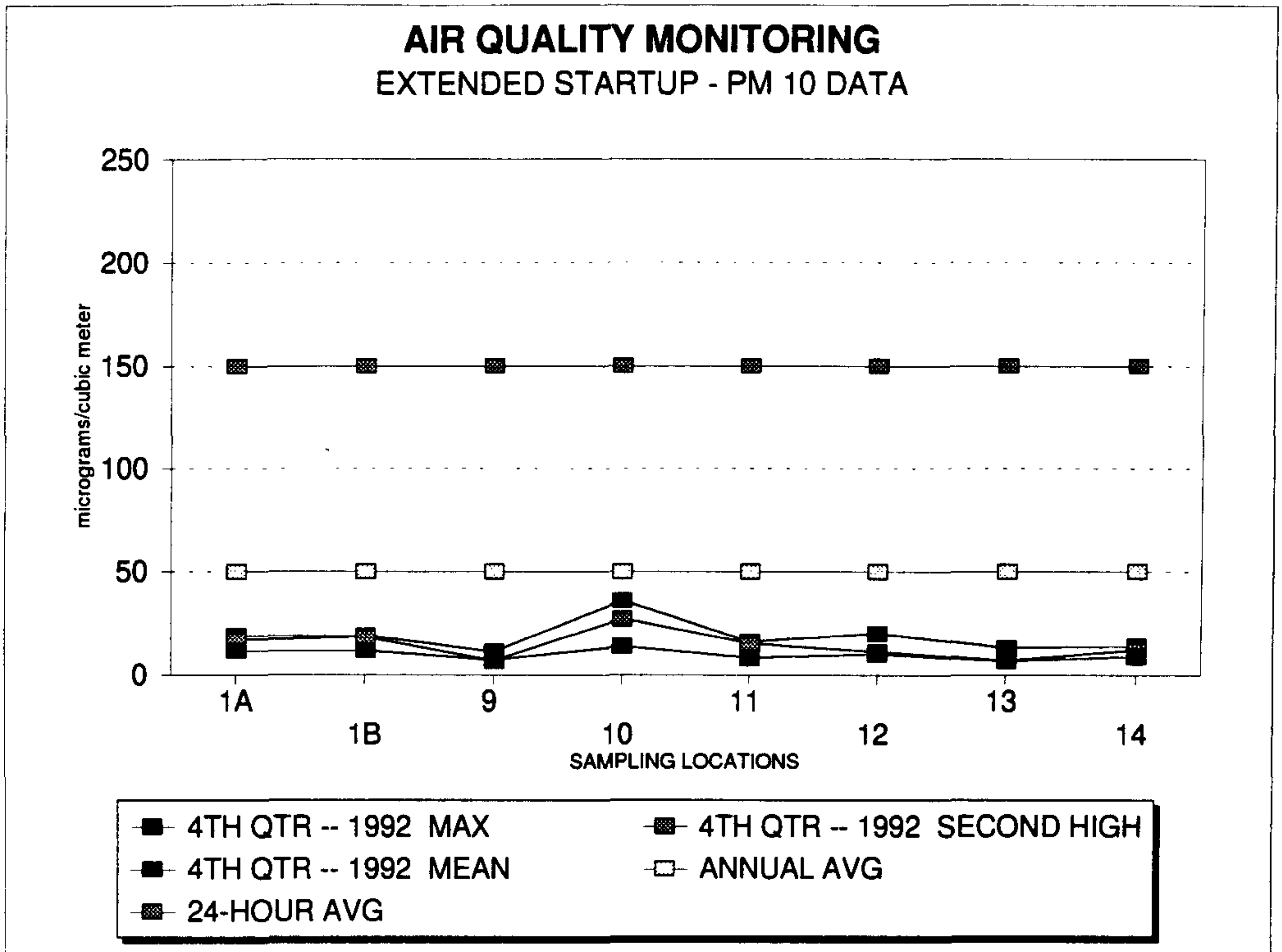


Figure AIR -4 (d). Air Quality Monitoring During Extended Start-Up PM_{10} Data (First Quarter -1993)

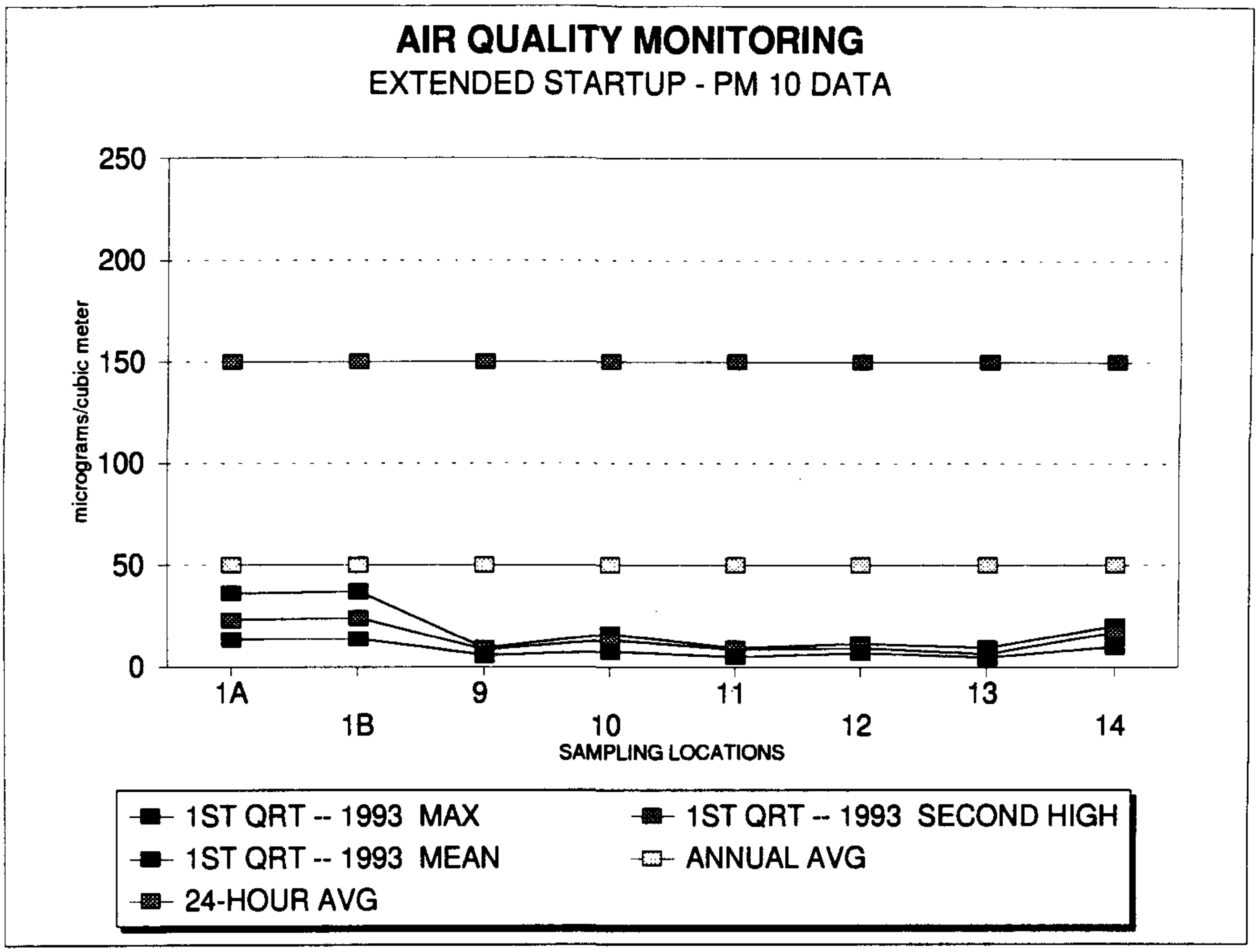


Figure AIR -4 (e). **Air Quality Monitoring During Extended Start-Up PM_{10} Data (Second Quarter -1993)**

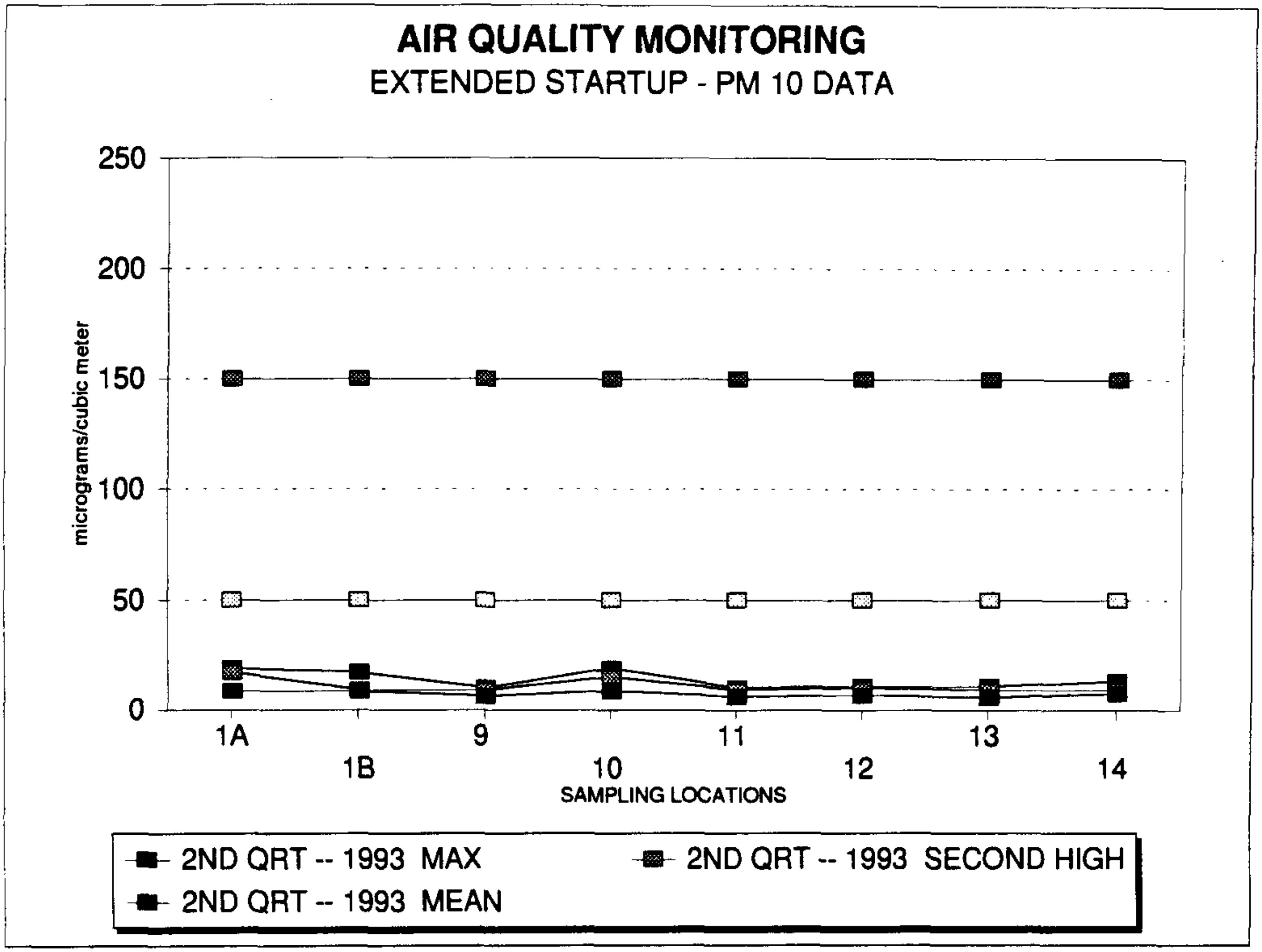


Figure AIR 5 (a). Air Quality Monitoring During Demonstration Operation - PM_{10} Data (Third Quarter - 1993)

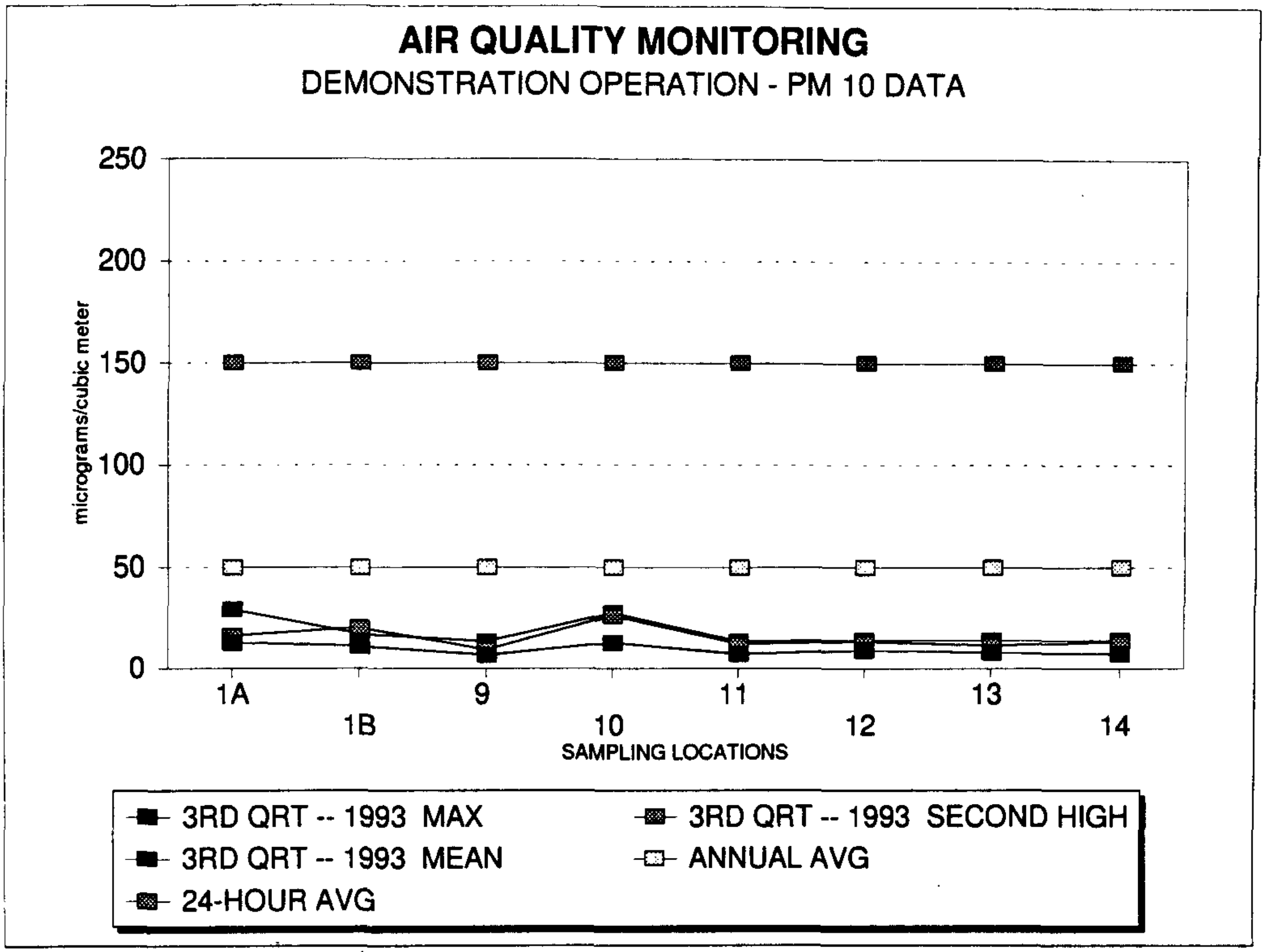


Figure AIR 5 (b). Air Quality Monitoring During Demonstration Operation - PM_{10} Data (Fourth Quarter - 1993)

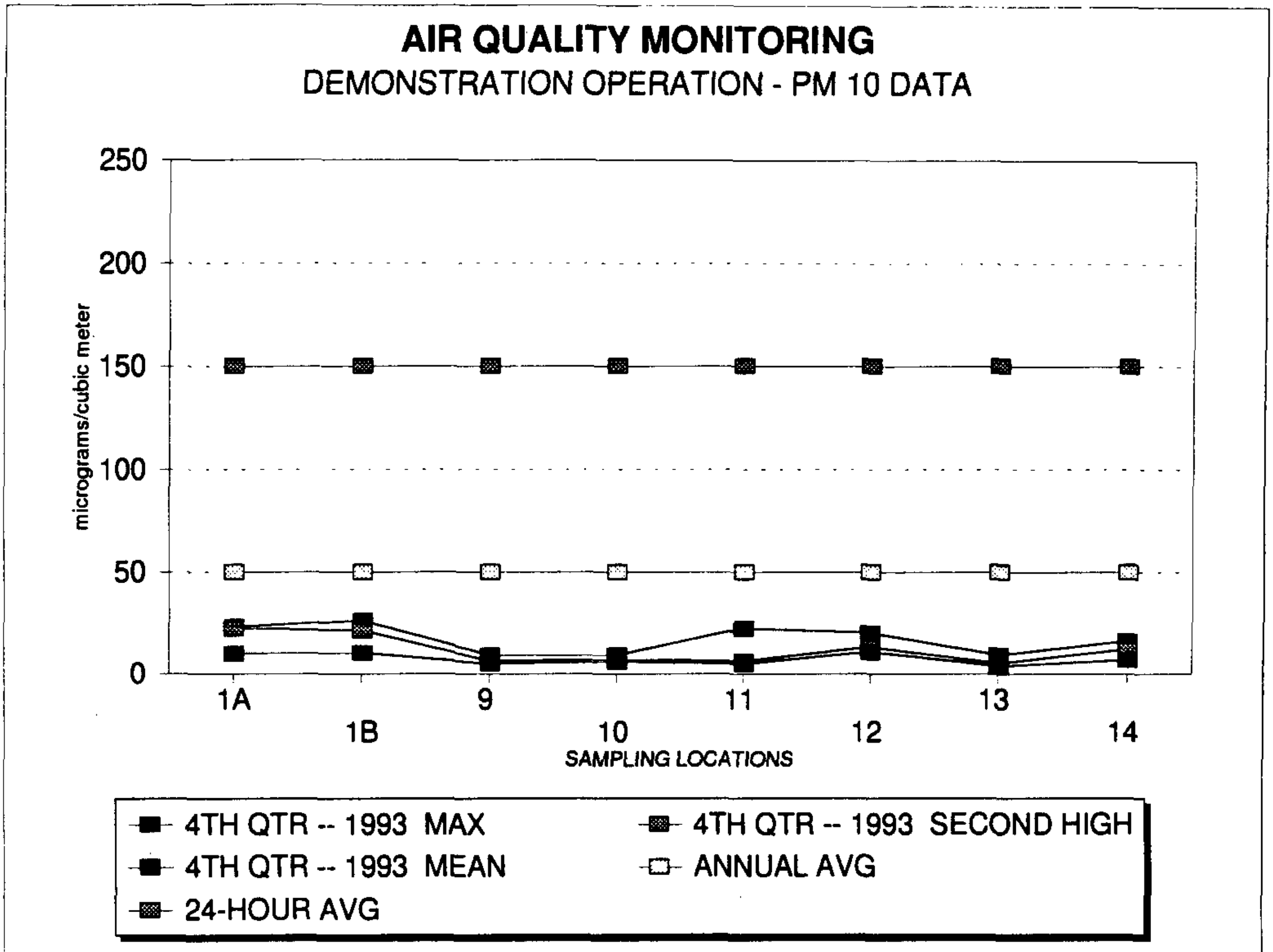


Table AIR-2. ACCP Stack Emissions Rates on May 18, 1994

Pollutant	Emission Rate (tons per year)[1]	Predicted Emission Rate (tons per year)[1]	Permitted Emission Rate
Particulate	11.2 (p.0259 gr./dscf)	11.9	0.031 gr./dscf
SO_2	01.0	35.5	**
NO_x	19.7	34.8	**
CO	42.1	28.3	**
Total Hydrocarbons	12.8	N/A	**

[1] Based on 24/hour/day, 365 day/year operation.
**Current permit does not address gaseous pollutants.

Table AIR-3. ACCP Extended Start-Up Data

	Combustion Air		Natural Gas		Stack
	P-401	T-401	F-402	P-406	T-700
Quarter	(psia)	F	(lb./min)	(psig)	F
2nd 1992					
3rd 1992	13.10	90	21.7	8.0	292
4th 1992	13.07	30	17.0	5.2	239
1st 1993	13.12	22	19.1	5.1	217
2nd 1993	13.11	43	21.0	6.1	223

Table AIR-4. ACCP Demonstration Data

	Combustion Air		Natural Gas		Stack
	P-401	T-401	F-402	P-406	T-700
Quarter	(psia)	F	(lb./min)	(psig)	F
3rd 1993	13.14	48	29.8	11.3	223
4th 1993	13.10	30	28.7	12.9	222
1st 1994	13.05	21	38.7	20.4	224
2nd 1994	13.03	46	47.4	25.9	235
3rd 1994	13.11	58	43.2	24.2	238
4th 1994	13.01	31	44.6	24.3	240
1st 1995	13.06	24	47.3	26.1	229
2nd 1995	13.04	39	47.1	26.5	229
3rd 1995	13.08	56	49.3	28.5	228

6.2 Water Quality

Water quality issues for the ACCP Demonstration Facility fall into two categories: (1) groundwater quality; and (2) cooling water used in the process.

Compliance monitoring includes sampling of the groundwater wells surrounding the ACCP Demonstration Facility. Supplemental monitoring includes monitoring cooling water supply and return flow, temperatures, and quality to ensure the process is operating correctly.

The major aquifers in the Colstrip area include the shallow alluvium found in major drainages, in the Rosebud and McKay coal seams, and the sub-McKay sandstone. Fine-grained sandstone in the Rosebud overburden and in the Rosebud-McKay interburden zones contains water on a local basis. However, these water-bearing zones are of limited area extent and generally have limited capabilities.

Colstrip area groundwater is highly variable in degree and type of mineralization, but is generally a magnesium-sulfate-type water with moderate concentrations of calcium, sodium, and bicarbonate. Waters from the Rosebud coal and Rosebud overburden are generally of the best quality while waters from the spoils and alluvia aquifers generally exhibit the highest Total Dissolved Solids (TDS) levels. The greatest range in TDS values occurs within the Rosebud coal aquifer. Mean pre-mine TDS values range from 400 mg/l to over 6,000 mg/l at individual wells.

6.2.1 Compliance Monitoring

Water quality compliance monitoring at the Rosebud Mine is already extensive. At the end of the 1990 water year, WECo was monitoring a total of 434 groundwater wells. The wells are spread throughout the mine and draw water from various depths and geologic structures. Ten of the 434 groundwater wells surrounding the ACCP Facility were selected based on which wells could be impacted the most by the facility and according to depth and proximity, both upgradient and downgradient of the facility, to report water quality data for this report. The following types of aquifers are reported: Alluvial Aquifer, designated on the map by WA, which is close to the surface (10 to 20 feet deep); McKay Aquifer, designated by WM, which is at an intermediate depth (80 to 120 feet deep); and Spoils Aquifer, designated by WS, which is overburden that has been backfilled. A map showing the selected wells is shown in Figure WTR-1.

The major importance of groundwater and surface water in the Colstrip vicinity is for livestock and wildlife use. The possibility of groundwater contamination resulting from normal facility operation is extremely limited. However, in the event that a spill from the facility produced enough leachate to reach the water table, the contaminate plume produced would primarily affect the East Fork Armells Creek alluvium. This is due to horizontal permeabilities exceeding vertical permeabilities in most stream laid sediments in the area, together with greater hydraulic conductivities exhibited in the alluvia than those within the underlying bedrock (overburden).

The type of water quality parameters analyzed for and permissible criteria are shown in Table WTR-1. Tables WTR-2 through WTR-4 list the actual water quality results according to aquifer type, sampling station, date, and historical timeline of the ACCP project. Figure s WTR-2 through WTR-8 show the water quality parameters for the specific type of aquifer based on the historical timeline of the ACCP project.

Prior to Construction (Prior to December 1990)
The water quality parameters used for required monitoring and the permissible limits are shown in the Figure s discussed previously. The water quality parameters listed in Table WTR-1 are within the permissible limits for livestock use. The water quality data obtained Prior to Construction is used as a base-line comparison for the project's historical development. Water quality downgradient versus upgradient was consistent and well within the permissible levels.

Construction and Start-up (December 1990 - May 1992)
During Construction and Start-up, all required monitoring parameters were within the required limits. Comparing the Construction and Start-up phase with the base-line information for Prior to Construction dissolved solids and associated conductivity increased slightly. Acidity was lower during Construction and Start-up as compared with the base-line data. Calcium, magnesium, potassium, sodium, sulfate, and the sodium adsorption ratio (SAR) show comparable results with a very slight increase in concentration from the base-line. The metals and nutrients were comparable to base-line concentrations. Water quality downgradient versus upgradient was consistent and well within the permissible levels.

Extended Start-up (May 1992 - August 1993)
During Extended Start-up, all required monitoring parameters were within the required limits. Comparing the Extended Start-up phase with the base-line information for Prior to Construction, total dissolved solids, conductivity, hardness, calcium, magnesium, potassium, sodium, bicarbonate, and sulfate were all higher than the base-line concentrations in the spoils wells; however, the higher levels can be related to the geology of the overburden being backfilled. Metal concentrations were comparable to the base-line data. Water quality downgradient versus upgradient was consistent and well within the permissible levels.

Demonstration Operation (August 1993 - ongoing)
During Demonstration Operation, all required monitoring parameters were within the required limits. Comparisons of the Demonstration Operation with the base-line information for Prior to

Construction showed an improvement in water quality. Water quality downgradient versus upgradient was consistent and well within the permissible levels.

6.2.2 Supplemental Monitoring

Typical direct-contact cooler/condensers are designed to a 10 - 15° approach temperature. Attaining the design temperature is determined by a number of items, but cooling water flow rate and temperature are the only parameters that can be easily controlled to attain design conditions. The cooling tower flow stream has a reasonable operating range capable of handling flows up to 5,600 lb./min. at an inlet temperature of 120 F with an outlet temperature of approximately 80 F.

The data for cooling water flow rates is not reported due to suspect data. The data is suspect due to ineffective calibration requirements. No data was taken on cooling water quality to date. It will be monitored in the future. The only supplemental data available is cooling water temperature for supply and return.

Extended Start-up (May 1992 - August 1993)
Table WTR-5 shows the average water temperature of cooling water supply and return. The temperatures of the cooling water supply (T-614) and return (T-604) are fairly consistent over time and are well within the design limits.

Demonstration Operation (August 1993 to ongoing)
Table WTR-6 shows the average water temperature of cooling water supply and return. The temperatures of the cooling water supply (T-614) and return (T-604) are fairly consistent over time and are well within the design limits.

Table WTR-1. Water Quality Parameters Analyzed in Selected Wells & Permissible Criteria

Quality Parameter	Permissible Criteria For Livestock Use
pH	6.0 to 9.0
Total dissolved solids	10,000 Mg/L
Conductivity	
Total hardness	
Total alkalinity	2,000 Mg/L
Acidity	
Sodium Adsorption Ratio (SAR)	
Ca	
Mg	<5,000 Mg/L
Na	<5,000 Mg/L
K	
Dissolved iron	
Dissolved manganese	
Dissolved aluminum	5 Mg/L
Bicarbonate	<2,000 Mg/L
Chloride	
Sulfate	
Nitrite/Nitrate N	<450 Mg/L
Fluoride	
Orthophosphate	
Total Boron	
Dissolved cadmium	
Dissolved copper	
Dissolved lead	
Dissolved mercury	0.1 Mg/L
Dissolved selenium	0.05 Mg/L
Dissolved vanadium	0.10 Mg/L
Dissolved zinc	24.0 Mg/L

Source: Environmental Studies Board National Academy of Science, National Academy of Engineering Water Quality Criteria, 1972.

Table WTR-2. Water Quality Monitoring Results for Alluvial Wells   page 1 of 4

Station ID	Sample Date	pH	Calc. TDS	Evap. TDS	Lab	Field	Total
Prior to Construction							
					Conductivity	Conductivity	Hardness
			(mg/l)	(mg/l)	(umhos/cm)	(umhos/cm)	(mg/l)
WA-127	7/26/89	7.6	2061	2200	2620		1445
WA-131	10/28/87	7.2	2868	3050	3140		1890
WA-101	7/26/89	7.7	1417	1440	1830		985
WA-139	8/1/89	7.6	1333	1370	1780		907
Construction & Start-Up							
WA-127	8/5/91					2150	
WA-131	7/26/91	7.3		3150	3400		1950
WA-101	10/31/91	7.7		1570	2000		1070
WA-101	6/24/91					1600	
WA-139	8/5/91					1553	
Extended Start-Up							
WA-127	8/2/93	8.1		2250	2530		1430
WA-101	8/2/93	7.9		1730	2050		1120
WA-139	8/2/93	8.1		1660	1960		1090
Demonstration Operation							
WA-131	11/19/93	7.7		3280	3450		2000
WA-101	9/17/93	7.9		348	624		324

Table WTR-2. Water Quality Monitoring Results for Alluvial Wells page 2 of 4

Total Alkalinity (mg/l)	Acidity (mg/l)	Sar	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Iron Dissolved (mg/l)	Manganese Dissolved (mg/l)
466	32	1.58	198	231	138	14	0.12	0.41
417		2	320	264	196	8	-0.05	1.23
359	19	1.08	147	150	78	13	0.36	0.21
343	16	1.13	126	144	78	16	0.22	0.62
431	N/A	2.03	330	274	206	11	0.33	1.32
453	N/A	1.22	158	165	92	10	-0.03	0.07
470	-1	1.68	202	224	146	12	-0.03	0.34
488	-1	1.27	164	172	98	10	-0.03	0.29
421	-1	1.25	153	171	95	10	-0.03	0.66
458	-1	2.22	342	278	228	13	-0.03	1.71
273	-1	0.37	58	44	16	3	-0.03	-0.01

Table WTR-2. Water Quality Monitoring Results for Alluvial Wells

Aluminum	Bcarb	Carb	Chloride	Sulfate	Nitrite/ Nitrate	Flouride	Orthnophos
Dissolved					N		
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
-0.1	569	0	19	1180	-0.05	0.18	0.2
-0.1	509	0	48	1780	-0.05	0.21	-0.01
0.2	438	0	13	799	0.38	0.38	0.08
0.1	419	0	11	751	-0.05	0.26	0.03
-0.1	525	0	64	1890	0.05	0.22	0.01
-0.1	553	0	18	775	0.2	0.27	0.21
-0.1	574	0	19	1150	0.1	0.18	0.18
-0.1	596	0	9	824	-0.05	0.2	0.32
-0.1	514	0	15	827	-0.05	0.22	0.6
-0.1	559	0	68	1860	-0.05	0.19	0.09
-0.1	333	0	7	69	-0.05	0.27	0.14

Table WTR-2. Water Quality Monitoring Results for Alluvial Wells page 4 of 4

Boron	Cadmium	Copper	Lead	Mercury	Selenium	Vandium	Zinc
Total	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
0.1	0.012	-0.02	-0.02	-0.0005	0.01	-0.2	-0.02
0.4	0.004	-0.01	-0.01	-0.001	-0.005	-0.1	-0.01
0.2	-0.005	-0.02	-0.02	-0.0005	0.011	-0.2	-0.02
0.2	0.005	-0.02	-0.02	-0.0005	-0.005	-0.2	-0.02
0.3	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.01
0.4	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.06
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.01
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.1
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	-0.01
	-0.001	-0.01		-0.001	-0.005	-0.1	0.01
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.04

Table WTR-3. Water Quality Monitoring Results for McKay Wells

Station ID	Sample Date	pH	Calc. TDS	Evap. TDS	Lab	Field	Total
Prior to Construction							
					Conductivity	Conductivity	Hardness
			(mg/l)	(mg/l)	(umhos/cm)	(umhos/cm)	(mg/l)
WM-130	12/6/85	7.2	2220	1440	2460		1496
WM-130	5/24/88					2335	
WM-184	2/12/87	7.8	1004	982	1430	1620	528
WM-184	6/21/90	7.8		1020	1440		543
WM-103	8/31/88					1720	
Construction & Start-Up							
WM-130	10/9/91					2250	
WM-103	10/15/91					1783	
Demonstration Operation							
WM-130	11/16/93	7.2		2380	2620		1500

Table WTR-3. Water Quality Monitoring Results for McKay Wells

Total Alkalinity (mg/l)	Acidity (mg/l)	Sar	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Iron Dissolved (mg/l)	Manganese Dissolved (mg/l)
420	0	1.42	263	204	126	10	2.59	0.19
277	0	2.7	97	70	142	6	-0.03	0.03
368		2.44	102	70	131	4	0.49	0.03
454	-1	1.58	259	207	141	8	0.13	0.1

Table WTR-3. Water Quality Monitoring Results for McKay Wells

Aluminum	Bicarb	Carb	Chloride	Sulfate	Nitrite/ Nitrate	Flouride	Ortnophos
Dissolved					N		
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
-0.1	513	0	11	1350	-0.05	0.24	0.04
-.0.1	459	0	4	458	-0.05	0.14	-0.01
-0.1	449	0	4	463	0.08	0.18	-0.01
-0.1	554	0	11	1320	-0.05	0.17	0.04

Table WTR-3. Water Quality Monitoring Results for McKay Wells

Boron	Cadmium	Copper	Lead	Mercury	Selenium	Vandium	Zinc
Total	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
0.4	-0.005	-0.02	-0.02	-0.001	-0.005	-0.2	-0.02
0.2	0.004	-0.01	-0.01	-0.001	0.005	-0.1	0.99
0.3	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.02
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	-0.01

Table WTR-4. Wate

Station ID	Sample Dat
Prior to Construction	
WS-113	6/16/8
WS-157	9/5/8
WS-107	8/31/8
Construction & Start-Up	
WS-157	11/11/9
WS-157	10/10/9
WS-107	10/9/9
Extended Start-Up	

Table WTR-4. Water Quality Monitoring Results for Spoil Wells

Total	Acidity	Sar	Ca	Mg	Na	K	Iron	Manganese
Alkalinity							Dissolved	Dissolved
(mg/l)	(mg/l)		(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
594	45	2.24	333	324	240	14	0.09	1.05
478	31	1.33	214	336	134	17	-0.05	0.49
501	40	1.19	132	191	91	10	0.12	0.54
503	N/A	1.36	202	295	130	15	0.03	0.53
743	0	2.11	364	375	241	13	-0.03	1.2
499	-1	1.43	185	271	130	15	-0.03	0.6
490	-1	1.1	156	157	81	8	-0.03	0.29

Table WTR-4. Water Quality Monitoring Results for Spoil Wells

Aluminum	Bicarb	Carb	Chloride	Sulfate	Nitrite/ Nitrate	Flouride	Ortnophos
Dissolved					N		Dissolved
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
-0.1	725	0	25	2010	0.08	0.21	4.1
0.2	583	0	23	1710	0.69	0.12	0.44
-0.1	611	0	14	754	0.32	0.22	6.96
-0.1	613	0	19	1360	-0.05	0.15	0.05
-0.1	907	0	26	2210	-0.05	0.26	0.1
-0.1	610	0	18	1240	0.1	0.13	0.02
-0.1	598	0	9	722	0.1	0.21	0.04

Table WTR-4. Water Quality Monitoring Results for Spoil Wells

Boron	Cadmium	Copper	Lead	Mercury	Selenium	Vandium	Zinc
Total	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
0.3	0.009	-0.02	-0.02	-0.0005	0.026	-0.2	-0.02
	-0.005	-0.02	-0.02	-0.0005	0.005	-0.2	0.65
0.1	-0.005	-0.02	-0.02	-0.005	0.005	-0.2	0.76
0.1	0.002	-0.01	-0.01	-0.001	-0.005	-0.1	0.32
0.3	0.003	-0.01	-0.01	-0.001	-0.005	-0.1	0.12
	0.002	-0.01	-0.01	-0.001	-0.005	-0.1	0.04
	-0.001	-0.01	-0.01	-0.001	-0.005	-0.1	0.06

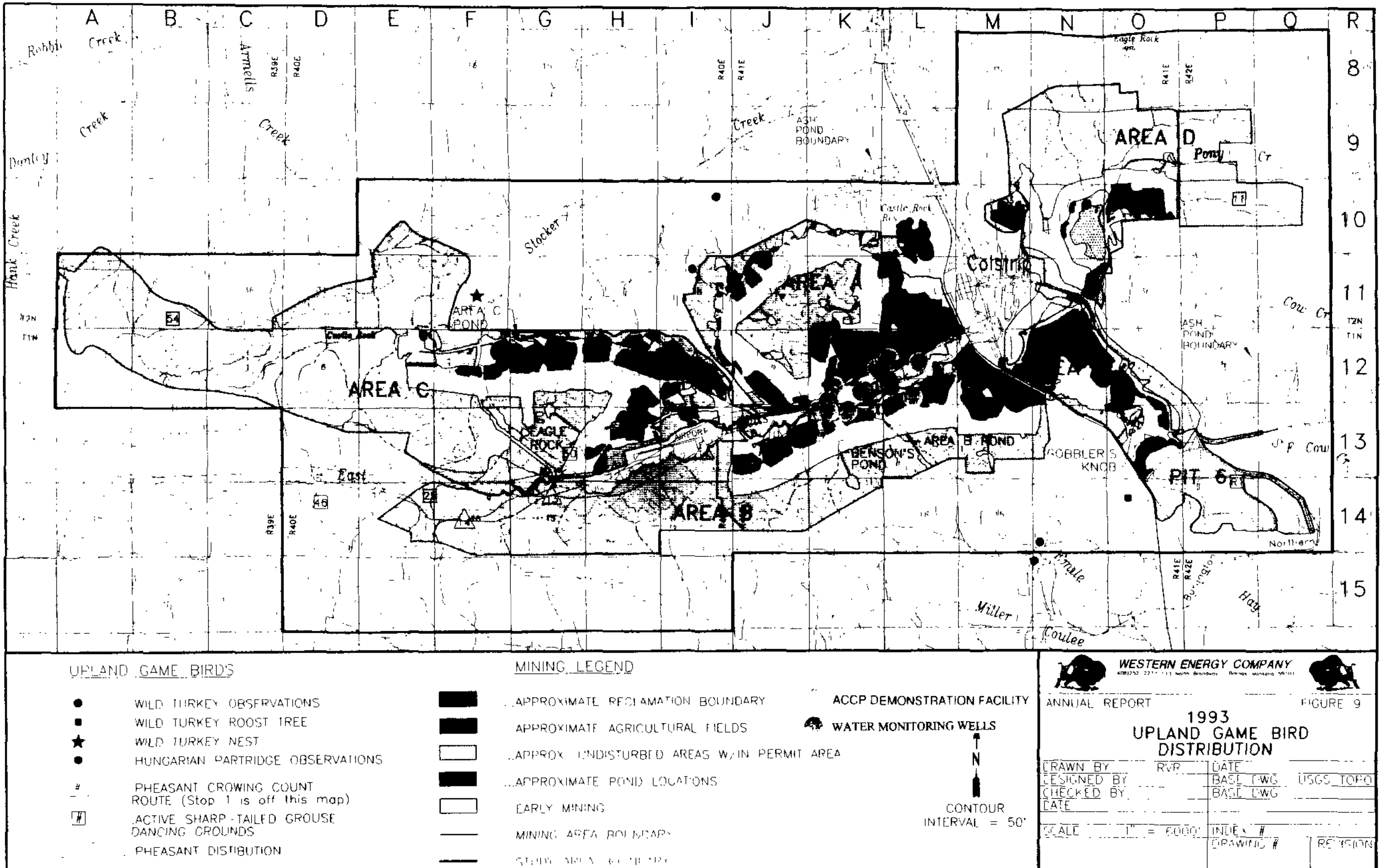


Figure WTR-1. Groundwater Monitoring Sites

Figure WTR-2. pH for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

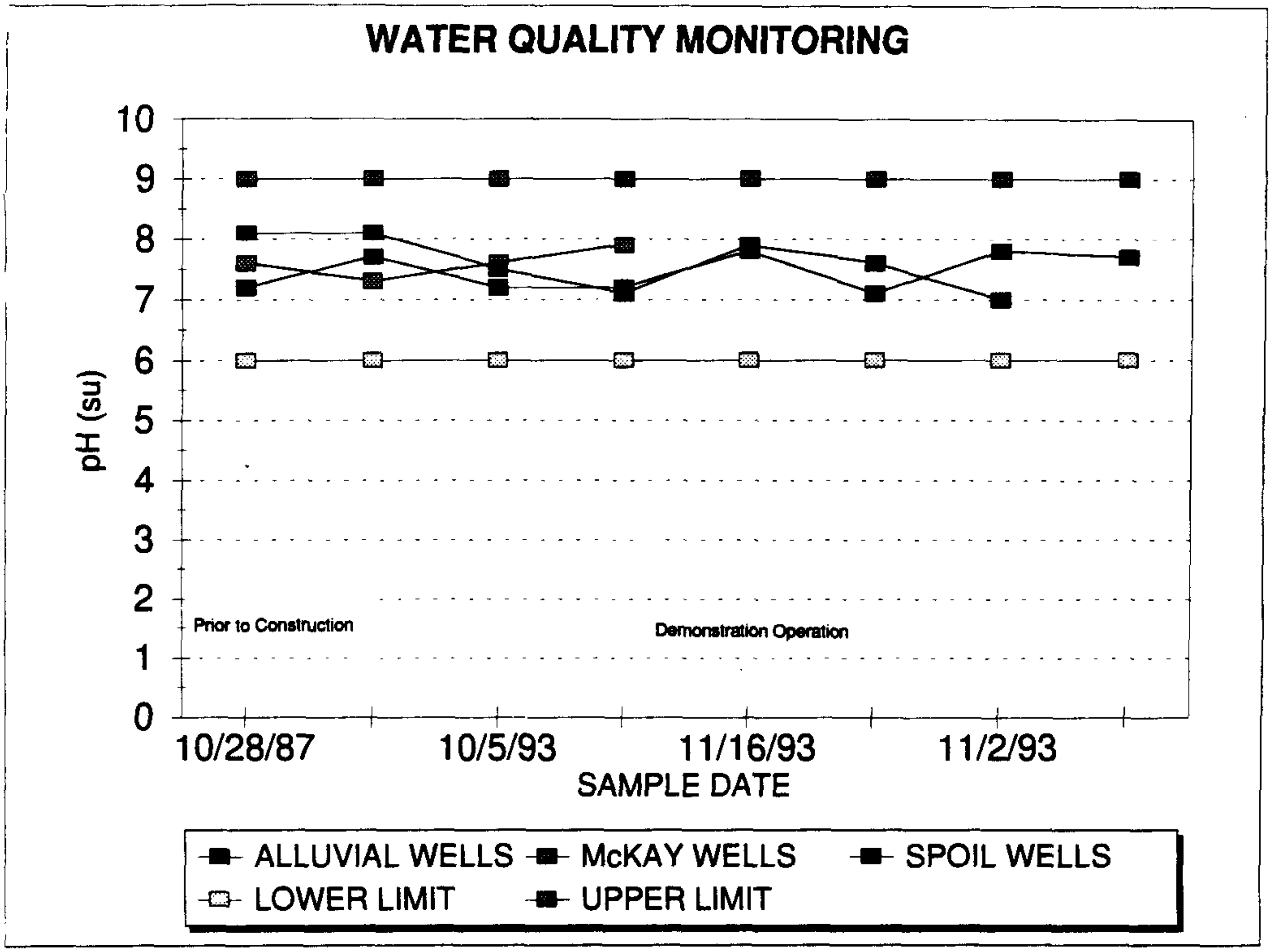


Figure WTR-3. Total Dissolved Solids for the Specific Type of Aquifer Based on a *Historical Timeline of the ACCP Project*

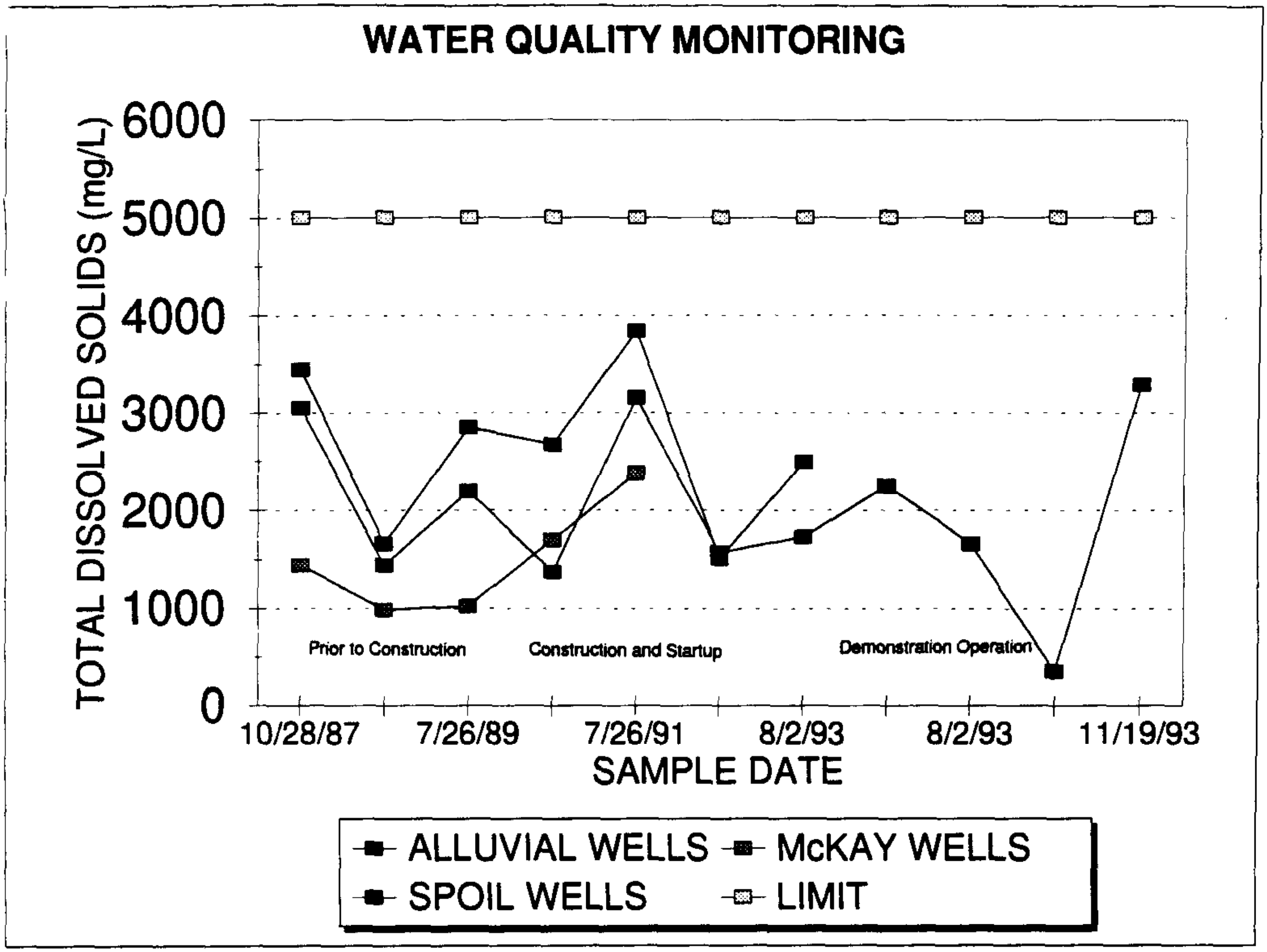


Figure WTR-4. The Alkalinity for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

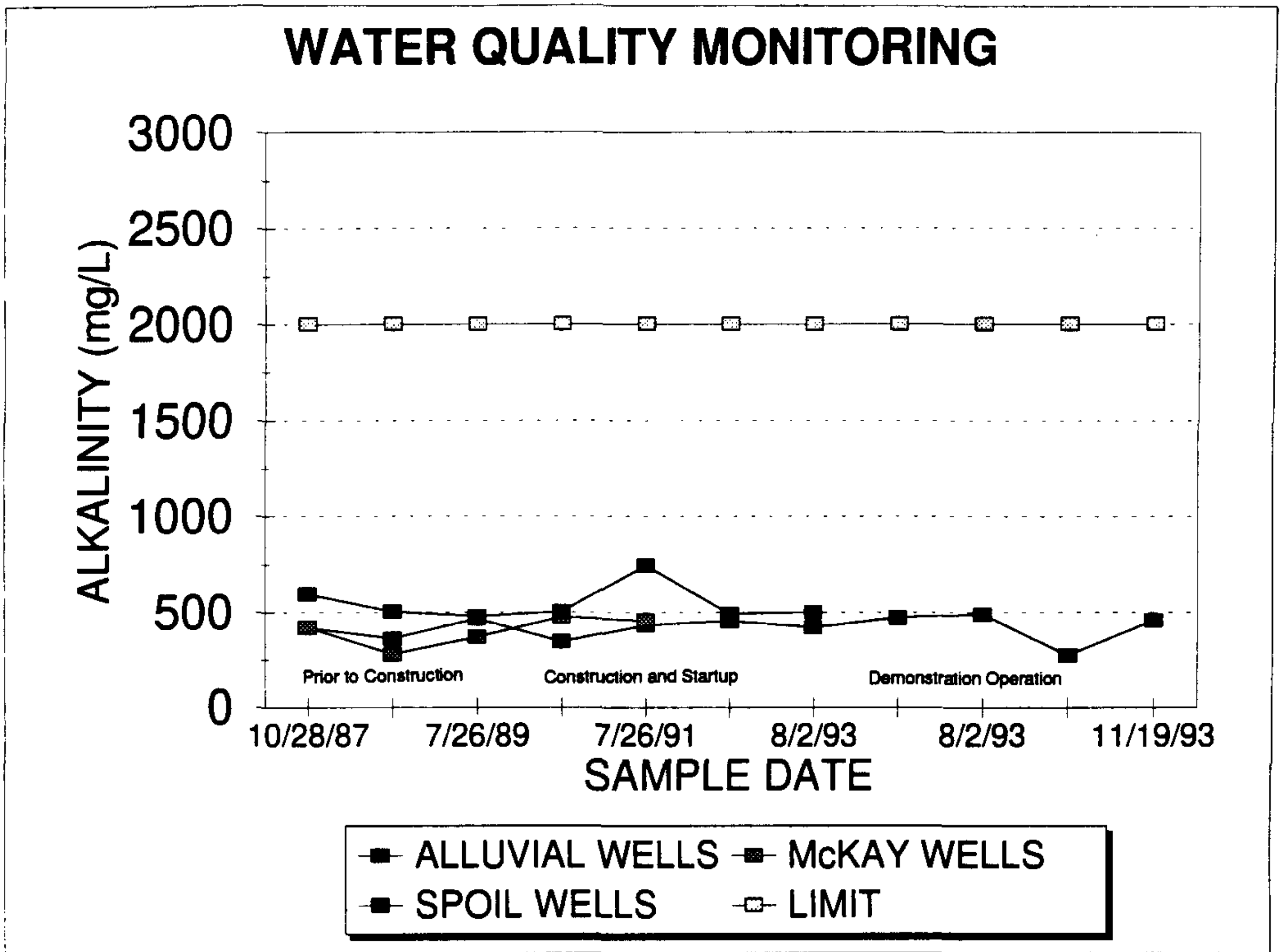


Figure WTR-5. Magnesium Concentrations for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

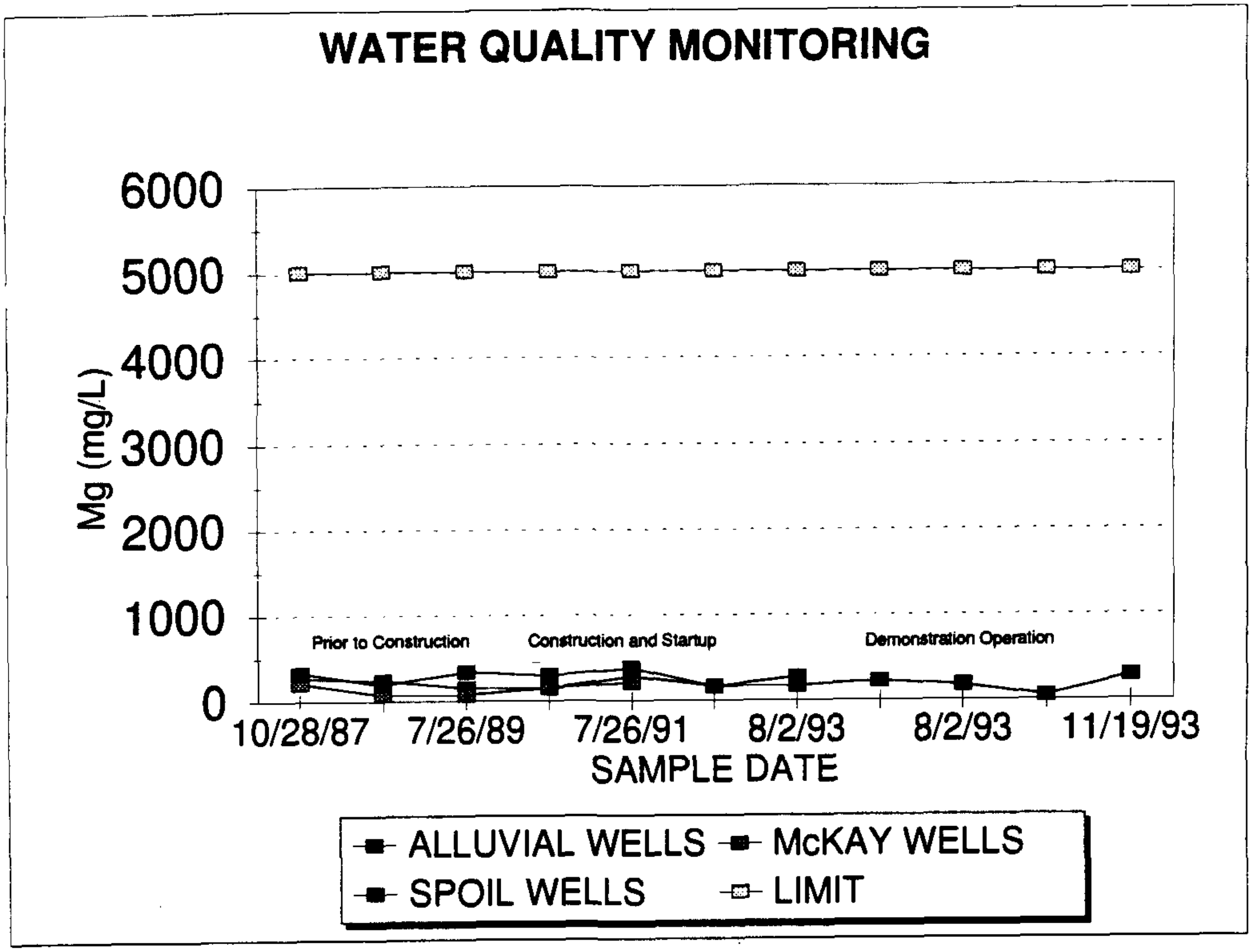


Figure WTR-6. The Sodium Concentrations for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

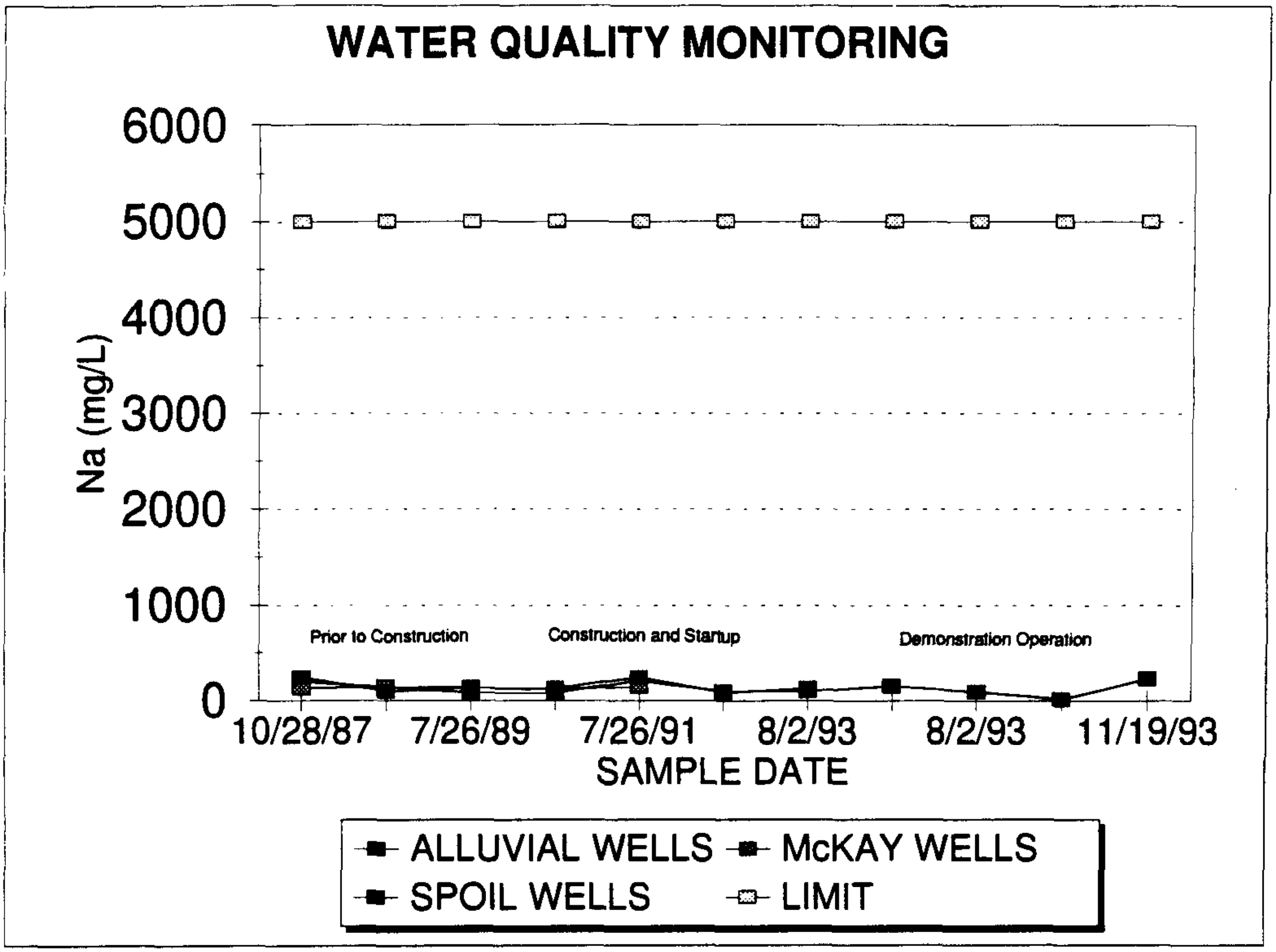


Figure WTR-7. The Bicarbonate Concentrations for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

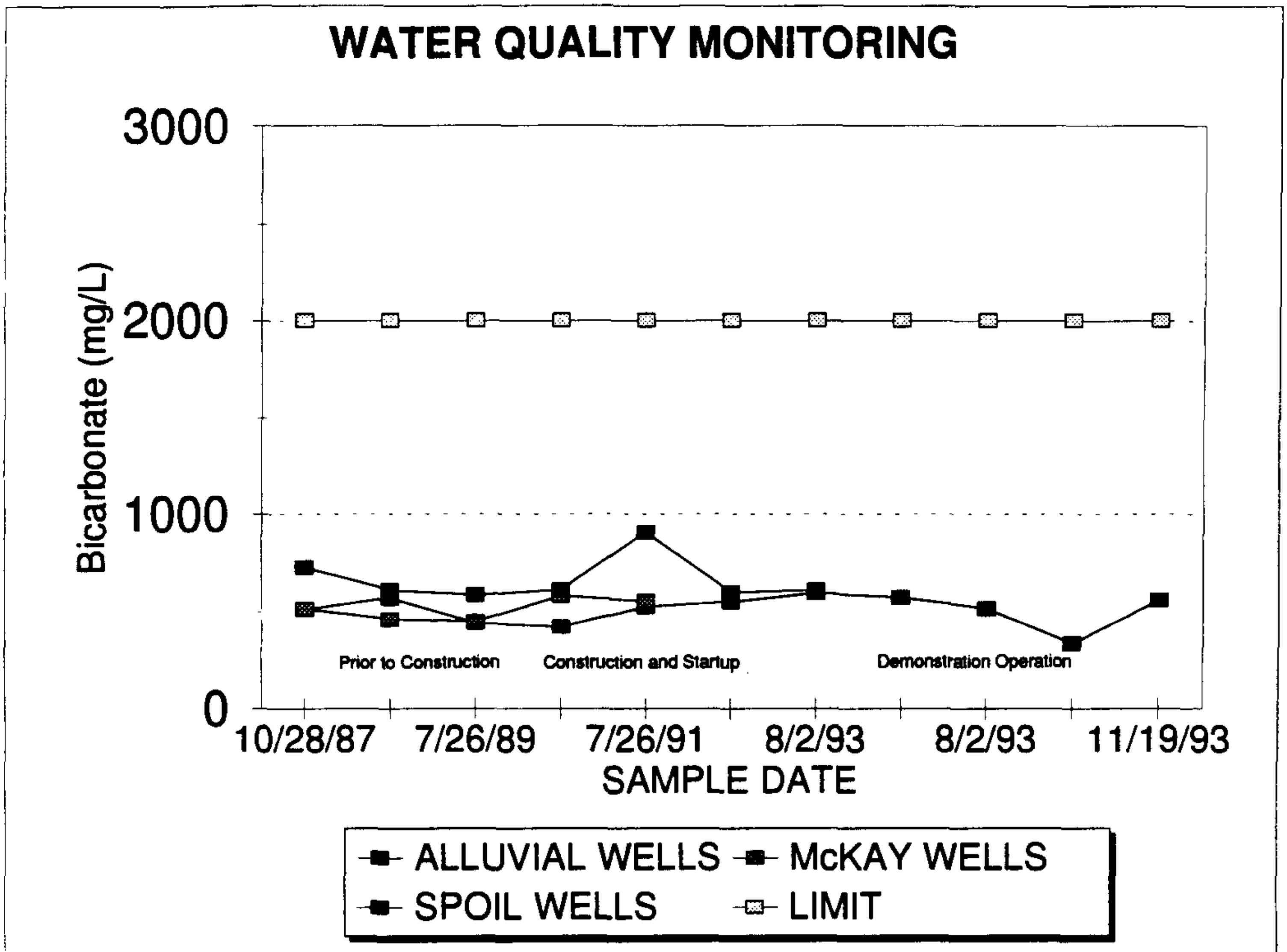


Figure WTR-8. The Nitrate/Nitrite Nitrogen Concentrations for the Specific Type of Aquifer Based on a Historical Timeline of the ACCP Project

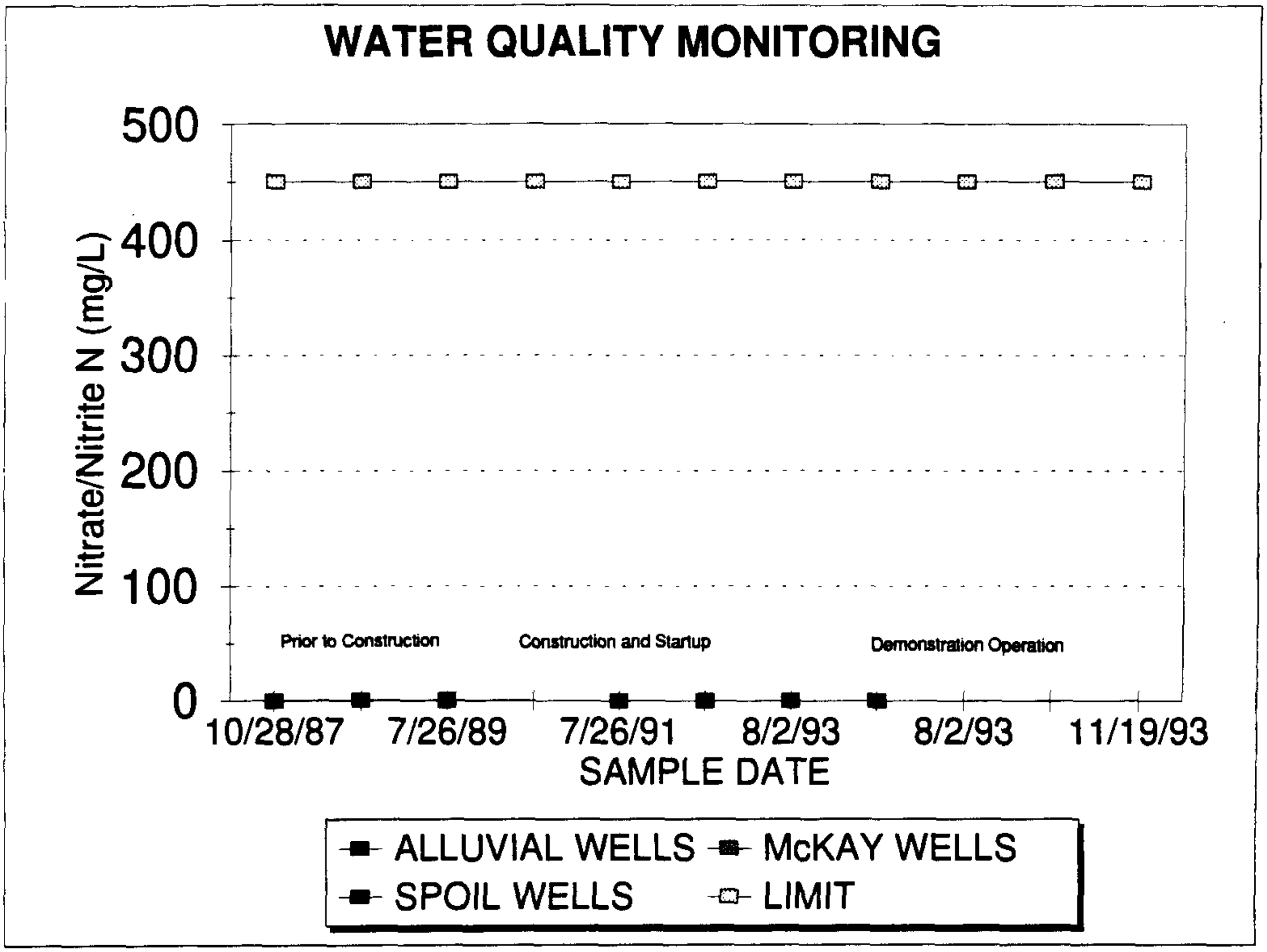


Table WTR 5. ACCP Extended Start-Up Data

	Cooling Water	
	T-614	T-604
Quarter	(°F)	(°F)
2nd 1992		
3rd 1992	70.6	100.5
4th 1992	63.5	88.3
1st 1993	61.1	92.0
2nd 1993	65.4	99.8

Table WTR 6. ACCP Demonstration Data

	Cooling Water	
	T-614	T-604
Quarter	(°F)	(°F)
3rd 1993	68.4	99.0
4th 1993	64.1	99.5
1st 1994	61.2	99.3
2nd 1994	71.8	106.8
3rd 1994	77.8	108.1
4th 1994	66.7	104.7
1st 1995	69.6	113.0
2nd 1995	76.1	113.5
3rd 1995	80.6	110.5

6.3 Solid Waste Disposal

There are two sources of solid waste generated at the ACCP Facility: (1) process slack, which is the waste material generated from the cleaning circuit; and (2) process fines, which is any material collected by the particulate removal system or Baghouse D-8-56.

Compliance monitoring includes sampling the fines, slack, and groundwater near disposal areas. Supplemental monitoring includes raw coal inlet, clean coal, dried coal, and product quality.

6.3.1 Compliance Monitoring

6.3.1.1 Process Slack

The original plan for disposing of the process slack was to blend it (when possible) with the top of seam coal being supplied to off-site customers. When this disposal method is unavailable, WECo's secondary disposal plan allowed the process slack to be placed in operating pits for burial. In March 1994, a new on-site slack disposal method was added to the permit which involves placing the process slack in front of the dragline or in the bench behind the dragline. Analysis had to be performed on the slack to ensure no acid would generate from the process slack. The results from the analysis performed on the slack are shown in Table SLD-1.

Prior to Construction (Prior to December 1990)

Process Slack Monitoring: Samples of Rosebud coal process slack produced at WECo's pilot coal cleaning plant in Butte, Montana, and samples of top/bottom of seam slack obtained from the Area A, B, and C pits at the Rosebud Mine were analyzed for EP toxicity and acid/base account by Northern Engineering and Testing, Inc. The results, which are summarized in Table SLD-1, indicate that the materials are non-hazardous and non-toxic-forming. Due to a high pyritic sulfur content, particularly for the process slack materials in which the pyrite becomes concentrated, acid/base account values indicate a potential for acid formation. However, the pyrite in these materials is a predominantly massive form with a small surface area and is considered relatively non-reactive. Dr. Doug Dollhopf of the Reclamation Research Unit at Montana State University studies 12 samples of Rosebud process slack to evaluate the potential acid producing characteristics. Dr. Dollhopf's conclusions were as follows: "Based on data presented in this report, these 12 coal cleanings samples will not cause acidification of any environmental resources. Samples designated A and B will likely yield acid upon oxidation and hydrolysis, but will be neutralized by natural base chemistry present in these materials. Samples C and D do not contain submicron-size pyrite capable of producing acid rapidly upon being oxidized. Consequently, acid produced, if any, from larger pyrite particles would be generated very slowly and be easily neutralized by base chemistry."

6.3.1.2 Process Slack Groundwater

A preliminary and conservative analysis of potential groundwater quality impacts was conducted in case the slack ever needed to be disposed of in the pits. Representative samples of process slack and top/bottom seam slack coal from active pits were analyzed by Northern Engineering and Testing, Inc., to determine concentrations of water soluble constituents in saturation paste extracts. The results are shown in Table SLD-2.

Prior to Construction (Prior to December 1990)

Process Slack Groundwater Monitoring: Slack sample parameters evaluated were based on primary, secondary, and livestock EPA water quality standards and were compared with similar analysis data conducted on water samples from pre-mine overburden, pre-mine Rosebud coal, and post-mine spoil wells. The data also indicates that there has been no impact on post-mine groundwater quality due to the oxidation of pyrites in the buried pit slack.

6.3.1.3 Process Fines

The process fines handling system was modified in June 1993 by adding drag conveyors and a bulk fines handling system. This modification enabled the process fines to be disposed of by two options: off-site sales to customers or on-site pit disposal using a slurry system when off-site sales lag production. The fines slurry pit associated with the ACCP Demonstration Facility is an old mine pit located approximately in the northwest corner of Section 5 near the intersection of 48,000N and 44,000E as shown in Figure SLD-1.

6.3.1.4 Process Fines Groundwater

Three wells were drilled to intercept the predicted flow path providing greater confidence of obtaining representative water quality levels within the area of influence. Well WR-104, screened in the Rosebud aquifer, serves as an upgradient well and has been sampled for chemical analysis six times since 1979. Well WS-107 is a downgradient well to the slurry pit, also screened in the Rosebud aquifer, but has been in spoils since the coal was mined out. It has been sampled for chemical analysis four times since 1983. The chemical analysis is similar to surface water except no total recoverable analysis is run on the groundwater samples. The results are shown in Tables SLD-3 through SLD-5 for the historical timeline for the ACCP Demonstration Facility. The groundwater monitoring results from the upgradient and downgradient wells around the slurry pit indicate no impact on groundwater.

Prior to Construction (Prior to December 1990)

Process Fines Groundwater Monitoring: The groundwater monitoring results from the upgradient well (WR-104) versus the downgradient well (WS-107) around the slurry pit indicated no impact on groundwater.

Construction and Start-up (December 1990 - May 1992)

Process Fines Groundwater Monitoring: The groundwater monitoring results from the upgradient well (WR-104) versus the downgradient well (WS-107) around the slurry pit indicated no impact on groundwater.

Extended Start-Up (May 1992 - August 1993)
Process Fines Monitoring: During Extended Start-up, samples from the slurry pit were collected both in January and April 1993. The results are shown in Table SLD-6. The results from the slurry samples indicated this disposal method to date has not and should not pose any environmental problems.

Demonstration Operation (August 1993 - ongoing)
Process Fines Groundwater Monitoring: The groundwater monitoring results from the upgradient well (WR-104) versus the downgradient well (WS-107) around the slurry pit indicated no impact on groundwater.

6.3.2 Supplemental Monitoring

The amount and composition of solid waste generated from the ACCP Demonstration Facility is a direct result of raw coal inlet (composition), process slack, flow rate and process fines flow rate.

The only data available is raw coal inlet flow (weight). The composition data was only taken during specific tests and is very sporadic and test specific.

Extended Start-Up (May 1992 - August 1993)
Table SLC-7 shows the average coal feed in tons per hour (TPH). The amount processed during Extended Start-up was much lower than design due to Start-up inefficiencies.

Demonstration Operation (August 1993 to Ongoing)
Table SLD-8 shows the average coal feed in TPH. The amount processed increased throughout the testing period as operation improved.

Table SLD-1. Characterization of Solid Wastes[1].

Standard	Parameter	Standard	Area A[2] Process Slack	Area B[2] Process Slack	Area C[2] Process Slack	Area D[2] Process Slack	Pit Slack[3]
EP Toxicity	As	5.0	<0.002	<0.002	<0.002	<0.002	<0.005
	Ba	100.0	0.163	0.117	0.071	0.221	0.4
	Cd	1.0	<0.005	<0.005	<0.005	<0.005	0.012
	Cr	5.0	0.050	0.020	0.020	0.070	0.13
	Pb	5.0	<0.020	<0.020	<0.020	<0.020	<0.02
	Hg	0.2	<0.001	<0.001	<0.001	<0.001	<0.0005
	Se	1.0	<0.002	<0.002	<0.002	<0.002	<0.005
	Ag	5.0	<0.020	<0.020	<0.020	<0.020	0.02
Acid/Base Account							
	Acid Pot, tons/1,000t		224	11	135	43	45
	Neut.Pot, tons/1,000t		32	19	20	38	42
	Net A/B, tons/1,000t,	5	-192	-92	-115	20	-3
	Total Sulfur, % dry		10.33	4.07	4.75	1.75	1.8
	Btu/#, dry		8,040	7,117	7,973	9,045	---
	Ash, % dry		36	45	37	29	---
	Lime, % dry		3.67	2.54	1.80	6.57	4.22

1 All values in Mg/L unless otherwise noted.
2 Average over three samples of Rosebud process slack.
3 Average over Areas A, B, and C pit samples.

Table SLD-2. Solid Waste Groundwater Quality Impact Analysis[1].

EPA Standard	Parameter	Allowable Level	Process[2] Slack Coal	Pit[3] Slack	Post-Mine[4] Spoils	Pre-Mine[5] Overburden	Pre-Mine[6] Rosebud Coal
Primary	As	0.05	<0.030	<0.030	---	---	---
	Ba	1.0	0.1	0.1	---	---	---
	Cd	0.010	<0.005	0.008	0.005	0.005	0.005
	Cr	0.05	<0.02	<0.02	0.01	0.0	0.024
	Pb	0.05	<0.02	<0.02	0.038	0.03	0.02
	Hg	0.002	0.0025	0.017	0.011	0.0	0.001
	NO_3-N	10.0	1.49	1.44	7.71	2.61	0.51
	Se	0.01	<0.015	<0.015	0.055	0.008	0.008
Secondary	Ag	0.05	<0.02	<0.02	---	---	---
	F	1.4-2.4	0.55	0.40	0.29	0.23	0.21
	Cl	250	<10.0	<10.0	22.3	10.5	9.6
	Cu	1.0	0.02	0.070	0.03	0.03	0.03
	Fe	0.3	0.06	0.14	0.19	0.29	0.23
	Mn	0.05	0.87	0.41	0.97	0.17	0.27
	SO_4	250	600	600	1,668	747	811
	Zn	5.0	0.09	0.12	0.44	0.21	0.29
	pH(st. units)	6.5-8.5	6.6	6.1	7.4	7.9	7.7
	TDS	500	1,200	1,200	2,959	1,405	1,597
Livestock	B	5.0	1.5	6.0	---	---	---
	Al	5.0	<0.1	<0.1	---	---	---
	V	0.1	<0.2	<0.2	0.01	0.18	0.43
Others	Ca	NS	3.1	10.2	326	106	165
	Mg	NS	2.2	12.1	298	125	162
	Na	NS	0.5	6.1	144	107	144

1 *All values in Mg/L unless otherwise noted.*
2 Process stack analysis from paste extract.
3 Averaged from Areas A, B, and C pit samples from paste extract.
4 Averaged over 83 wells using detection limit if undetectable, Ca, Mg, Na used 66 wells.
5 Averaged over 89 wells using detection limit if undetectable, Ca, Mg, Na used 75 wells.
6 Averaged over 153 wells using detection limit if undetectable, Ca, Mg, Na used 130 wells.
NS - No Standard.

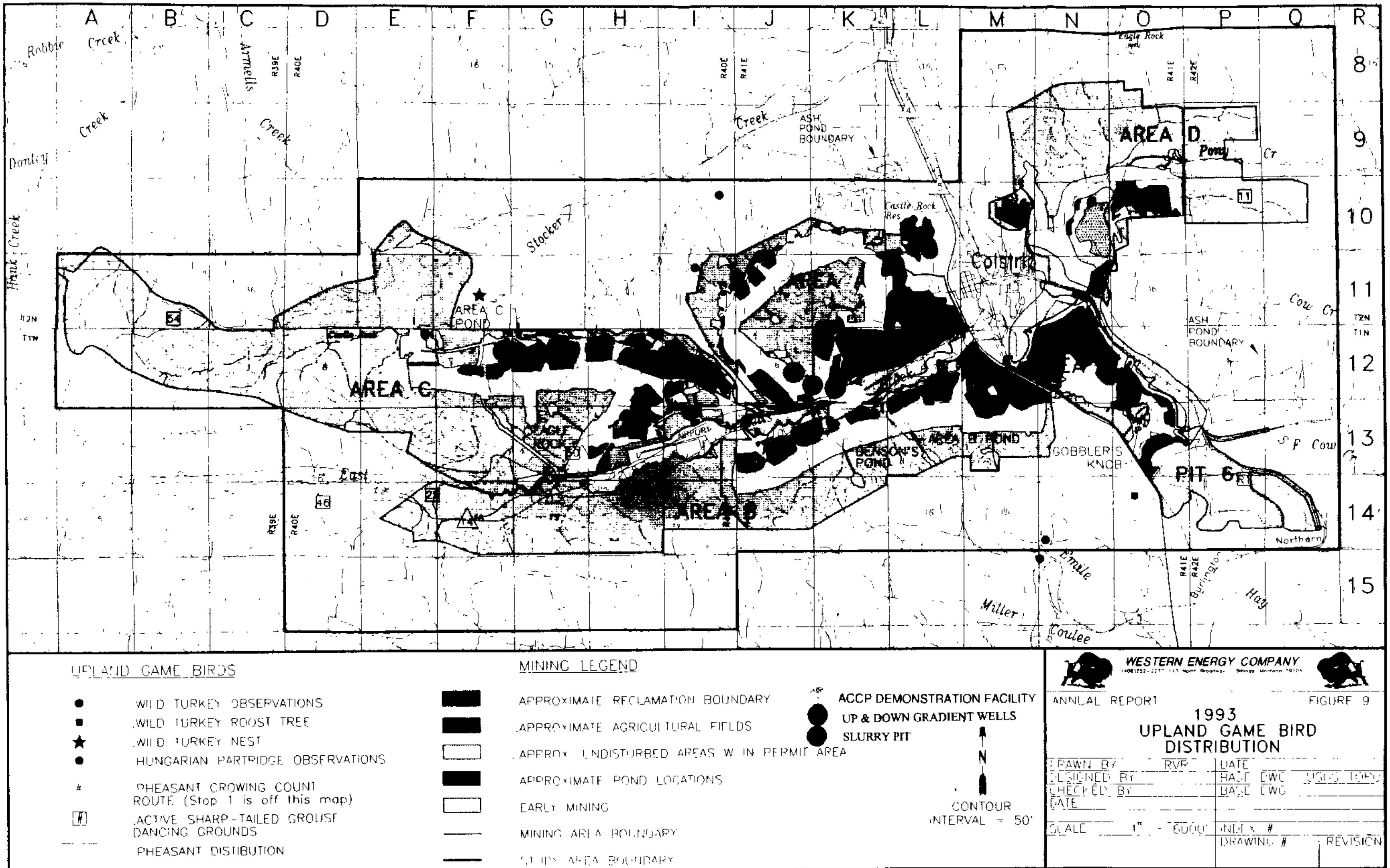


Figure SLD-1. Fines Slurry Pit Associated With the ACCP Demonstration Facility

Table SLD-3. **Water Monitoring from Upgradient and Downgradient Monitoring Wells**
Surrounding the Slurry Fines Pit (Prior to Construction)

LOCATION		UPGRADIENT WELL						
SAMPLE ID		WR-104						
DATE SAMPLED		11/6/79	12/17/79	12/7/85	9/1/88	9/12/89	12/2/90	10/17/83
		mg/l (ppm)						
POTASSIUM		7	7	9		8	4	
SODIUM		95	99	88		98	79	
CALCIUM		146	145	150		165	171	
MAGNESIUM		126	121	136		129	141	
SULFATE		447	453	496		503	538	
CHLORIDE		7	4	3		8	4	
CARBONATE		0	0	0		0	0	
BICARBONATE		739	727	759		762	792	
TDS @ 180 C		1260	1240	1370		1350	1430	2700
TOTAL ALKALINITY AS CaCO3		606	596	622		624	649	
TOTAL HARDNESS		884	862	934		943	1010	
sp. Cond. @ 25 C, umhos/cm		1710	1690	1700	1545	1550	1840	1550
pH s.u.		7.4	7.2	7.3		7.3	7.2	
TOTAL SUSPENDED SOLIDS								
TOTAL OIL AND GREASE								
TURBIDITY, N.T.U.								
NITRATE + NITRITE AS N		0.02	0.02	<0.05		<0.05	<0.05	
ORTHOPHSPHATE AS P		<0.01	0.01	0.06		0.83	0.11	
FLUORIDE		0.09	0.09	0.15		0.1	0.18	
SODIUM ADSORPTION RATIO		1039	1.47	1.25		1.39	1.08	
TOTAL SETTABLE SOLIDS, ml/l								
TOTAL ORGANIC CARBON								
METALS								
ALUMINUM	TOTAL RECOVERABLE							
ALUMINUM	DISSOLVED	0.3	<0.1	<0.1		<0.1	<0.1	
ARSENIC	TOTAL RECOVERABLE							
ARSENIC	DISSOLVED							
BORON	TOTAL RECOVERABLE							

Table SLD-3. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Prior to Construction)

BORON	DISSOLVED	0.5	0.5	<0.1			0.4	
CADMIUM	TOTAL RECOVERABLE							
CADMIUM	DISSOLVED	<0.005	<0.005	<0.005		<0.005	<0.001	
CHROMIUM	TOTAL RECOVERABLE							
CHROMIUM	DISSOLVED					<0.02		
COPPER	TOTAL RECOVERABLE							
COPPER	DISSOLVED	0.07	<0.01	<0.02		<0.02	<0.01	
IRON	TOTAL RECOVERABLE							
IRON	DISSOLVED	0.05	0.08	<0.05		0.31	0.08	
LEAD	TOTAL RECOVERABLE							
LEAD	DISSOLVED	<0.02	<0.02	<0.02		<0.02	<0.01	
MANGANESE	TOTAL RECOVERABLE							
MANGANESE	DISSOLVED			0.21		0.23	0.09	
MERCURY	TOTAL RECOVERABLE							
MERCURY	DISSOLVED	<0.001	<0.001	<0.001		<0.005	<0.001	
MOLYBDENUM	TOTAL RECOVERABLE							
MOLYBDENUM	DISSOLVED							
NICKEL	TOTAL RECOVERABLE							
NICKEL	DISSOLVED							
SELENIUM	TOTAL RECOVERABLE							
SELENIUM	DISSOLVED	<0.005	<0.005	<0.005		<0.005	<0.005	
SILVER	TOTAL RECOVERABLE							
SILVER	DISSOLVED							
VANADIUM	TOTAL RECOVERABLE							
VANADIUM	DISSOLVED	<1	<1	<0.2		<0.2	<0.1	
ZINC	TOTAL RECOVERABLE							
ZINC	DISSOLVED	0.18	0.1	1.03		3081	<0.01	

Table SLD-3. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Prior to Construction

DOWNGRADIENT WELL WS-107				
12/9/83	5/10/84	12/18/85	5/24/88	8/31/89
mg/l (ppm)				
9		6		10
82		81		91
210		142		132
168		182		191
796		620		754
4		12		14
0		0		0
674		619		611
1700		1450		1660
552		507		501
1220		1100		1116
2070	1100	1800	1700	1990
7.1		7.2		7.1
2.67		23.6		0.32
0.17		0.01		0.21
0.2		0.25		0.22
1.02		1.1		1.19
0.2		<0.1		<0.1

Table SLD-3. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Prior to Construction)

0.2		0.2		0.1
<0.005		0.002		<0.005
		<0.02		
<0.02		<0.01		<0.02
<0.05		<0.03		0.12
<0.02		<0.01		<0.02
		0.27		0.54
<0.001		<0.001		<0.0005
<0.005		<0.005		0.005
<0.2		<0.1		<0.2
1.2		0.31		0.76

Table SLD-4. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Construction and Start-Up) page 1 of 2

LOCATION		UPGRADIENT WELL	DOWNGRADIENT WELL
SAMPLE ID		WR-104	WS-107
DATE SAMPLED		10/15/91	10/9/91
POTASSIUM			
SODIUM			
CALCIUM			
MAGNESIUM			
SULFATE			
CHLORIDE			
CARBONATE			
BICARBONATE			
TDS @ 180 C			
TOTAL ALKALINITY AS CaCO3			
TOTAL HARDNESS			
sp. Cond. @ 25 C, umhos/cm		1850	1700
pH s.u.			
TOTAL SUSPENDED SOLIDS			
TOTAL OIL AND GREASE			
TURBIDITY, N.T.U.			
NITRATE + NITRITE AS N			
ORTHOPHSPHATE AS P			
FLUORIDE			
SODIUM ADSORPTION RATIO			
TOTAL SETTABLE SOLIDS, ml/l			
TOTAL ORGANIC CARBON			
METALS			
ALUMINUM	TOTAL RECOVERABLE		
ALUMINUM	DISSOLVED		
ARSENIC	TOTAL RECOVERABLE		
ARSENIC	DISSOLVED		
BORON	TOTAL RECOVERABLE		
BORON	DISSOLVED		
CADMIUM	TOTAL RECOVERABLE		
CADMIUM	DISSOLVED		
CHROMIUM	TOTAL RECOVERABLE		
CHROMIUM	DISSOLVED		
COPPER	TOTAL RECOVERABLE		
COPPER	DISSOLVED		
IRON	TOTAL RECOVERABLE		
IRON	DISSOLVED		
LEAD	TOTAL RECOVERABLE		
LEAD	DISSOLVED		
MANGANESE	TOTAL RECOVERABLE		
MANGANESE	DISSOLVED		

Table SLD-4. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Construction and Start-Up) page 2 of 2

MERCURY	TOTAL RECOVERABLE		
MERCURY	DISSOLVED		
MOLYBDENUM	TOTAL RECOVERABLE		
MOLYBDENUM	DISSOLVED		
NICKEL	TOTAL RECOVERABLE		
NICKEL	DISSOLVED		
SELENIUM	TOTAL RECOVERABLE		
SELENIUM	DISSOLVED		
SILVER	TOTAL RECOVERABLE		
SILVER	DISSOLVED		
VANADIUM	TOTAL RECOVERABLE		
VANADIUM	DISSOLVED		
ZINC	TOTAL RECOVERABLE		
ZINC	DISSOLVED		

Table SLD-5. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Demonstration Operation) page 1 of 2

LOCATION		UPGRADIENT WELL	DOWNGRADIENT WELL
SAMPLE ID		WR-104	WS-107
DATE SAMPLED		10/21/93	10/5/93
		mg/l (ppm)	mg/l (ppm)
POTASSIUM		8	8
SODIUM		101	81
CALCIUM		169	156
MAGNESIUM		138	157
SULFATE		546	722
CHLORIDE		3	9
CARBONATE		0	0
BICARBONATE		844	598
TDS @ 180 C		1430	1510
TOTAL ALKALINITY AS CaCO3		691	490
TOTAL HARDNESS		988	1040
Sp. Cond. @ 25, umhos/cm			
sp. Cond. @ 25 C, umhos/cm		1870	1840
pH s.u.		7.2	7.6
TOTAL SUSPENDED			
TOTAL SUSPENDED SOLIDS			
TOTAL OIL AND			
TOTAL OIL AND GREASE			
TURBIDITY, N.T.U.			
NITRATE + NITRITE			
NITRATE + NITRITE AS N		<0.05	0.1
ORTHOPHOSPHATE			
ORTHOPHSPHATE AS P		0.02	0.04
FLUORIDE		0.11	0.21
SODIUM ADSORPTION			
SODIUM ADSORPTION RATIO		1.4	1.1
TOTAL SETTABLE			
TOTAL SETTABLE SOLIDS, ml/l			
TOTAL ORGANIC			
TOTAL ORGANIC CARBON			
METALS			
ALUMINUM	TOTAL RECOVERABLE		
ALUMINUM	DISSOLVED	<0.1	<0.1
ARSENIC	TOTAL RECOVERABLE		
ARSENIC	DISSOLVED		
BORON	TOTAL RECOVERABLE		
BORON	DISSOLVED		
CADMIUM	TOTAL RECOVERABLE		
CADMIUM	DISSOLVED	0.001	<0.001

Table SLD-5. Water Monitoring from Upgradient and Downgradient Monitoring Wells Surrounding the Slurry Fines Pit (Demonstration Operation) page 2 of 2

CHROMIUM	TOTAL RECOVERABLE		
CHROMIUM	DISSOLVED		
COPPER	TOTAL RECOVERABLE		
COPPER	DISSOLVED	<0.01	<0.01
IRON	TOTAL RECOVERABLE		
IRON	DISSOLVED	<0.03	<0.03
LEAD	TOTAL RECOVERABLE		
LEAD	DISSOLVED	<0.01	<0.01
MANGANESE	TOTAL RECOVERABLE		
MANGANESE	DISSOLVED	0.08	0.29
MERCURY	TOTAL RECOVERABLE		
MERCURY	DISSOLVED	<0.001	<0.001
MOLYBDENUM	TOTAL RECOVERABLE		
MOLYBDENUM	DISSOLVED		
NICKEL	TOTAL RECOVERABLE		
NICKEL	DISSOLVED		
SELENIUM	TOTAL RECOVERABLE		
SELENIUM	DISSOLVED	<0.005	<0.005
SILVER	TOTAL RECOVERABLE		
SILVER	DISSOLVED		
VANADIUM	TOTAL RECOVERABLE		
VANADIUM	DISSOLVED	<0.1	<0.1
ZINC	TOTAL RECOVERABLE		
ZINC	DISSOLVED	0.03	0.06

Table SLD-6. Fines Slurry Pit Samples Collected During Extended Start-Up

LOCATION		SLURRY PIT	
SAMPLE ID		ASP-1	
DATE SAMPLED		1/29/93	4/2/93
		mg/l (ppm)	
POTASSIUM		10	8
SODIUM		113	104
CALCIUM		126	103
MAGNESIUM		124	86
SULFATE		835	647
CHLORIDE		14	13
CARBONATE		0	0
BICARBONATE		227	185
TDS @ 180 C		1340	1120
TOTAL ALKALINITY AS CaCO3		186	152
TOTAL HARDNESS		823	610
sp. Cond. @ 25 C, umhos/cm		1770	1390
pH s.u.		7.5	8
TOTAL SUSPENDED SOLIDS		27	26
TOTAL OIL AND GREASE		NA	<1
TURBIDITY, N.T.U.		14	5.5
NITRATE + NITRITE AS N		0.2	0.22
ORTHOPHSPHATE AS P		0.02	0.02
FLUORIDE		0.34	0.34
SODIUM ADSORPTION RATIO		1.71	1.84
TOTAL SETTABLE SOLIDS, ml/l		<0.5	<0.5
TOTAL ORGANIC CARBON		3	≤2
METALS			
ALUMINUM	TOTAL RECOVERABLE	0.2	0.2
ALUMINUM	DISSOLVED	<0.1	<0.1
ARSENIC	TOTAL RECOVERABLE	<0.005	<0.005
ARSENIC	DISSOLVED	<0.005	<0.005
BORON	TOTAL RECOVERABLE	0.3	0.3
BORON	DISSOLVED	0.3	0.3
CADMIUM	TOTAL RECOVERABLE	<0.001	<0.001
CADMIUM	DISSOLVED	<0.001	<0.001
CHROMIUM	TOTAL RECOVERABLE	<0.01	<0.01
CHROMIUM	DISSOLVED	<0.01	<0.01
COPPER	TOTAL RECOVERABLE	<0.01	<0.01
COPPER	DISSOLVED	<0.01	<0.01
IRON	TOTAL RECOVERABLE	0.28	0.12
IRON	DISSOLVED	0.17	<0.03
LEAD	TOTAL RECOVERABLE	0.02	0.01
LEAD	DISSOLVED	<0.01	<0.01
MANGANESE	TOTAL RECOVERABLE	0.09	0.09
MANGANESE	DISSOLVED	0.09	0.08

Table SLD-6. Fines Slurry Pit Samples Collected During Extended Start-Up page 2 of 2

MERCURY	TOTAL RECOVERABLE	<0.001	<0.001
MERCURY	DISSOLVED	<0.001	<0.001
MOLYBDENUM	TOTAL RECOVERABLE	<0.005	0.007
MOLYBDENUM	DISSOLVED	<0.005	0.007
NICKEL	TOTAL RECOVERABLE	<0.01	<0.01
NICKEL	DISSOLVED	<0.01	<0.01
SELENIUM	TOTAL RECOVERABLE	<0.005	<0.005
SELENIUM	DISSOLVED	<0.005	<0.005
SILVER	TOTAL RECOVERABLE	<0.005	<0.005
SILVER	DISSOLVED	<0.005	<0.005
VANADIUM	TOTAL RECOVERABLE	<0.10	<0.10
VANADIUM	DISSOLVED	<0.10	<0.10
ZINC	TOTAL RECOVERABLE	0.02	0.04
ZINC	DISSOLVED	0.02	0.02

Table SLD-7. ACCP Extended Start-Up Data

Quarter	Coal Feed W-76 (TPH)
2nd 1992	
3rd 1992	31.2
4th 1992	27.2
1st 1993	21.5
2nd 1993	27.4

Table SLD-8. ACCP Demonstration Data

Quarter	Coal Feed W-76 (TPH)
3rd 1993	34.0
4th 1993	35.4
1st 1994	46.3
2nd 1994	66.6
3rd 1994	63.1
4th 1994	58.3
1st 1995	65.5
2nd 1995	67.2
3rd 1995	66.2

6.4 Health and Safety

Compliance monitoring includes noise surveys, monitoring and control of dust, and continuous methane monitoring at specified locations. Supplemental monitoring includes spot check measurements, audiograms, and gas and explosive levels prior to work or entry into specific areas.

6.4.1 Compliance Monitoring

6.4.1.1 Accidents, Injuries, Incident Reports

MSHA develops rates of injury occurrence (incident rates (IR)) on the basis of 200,000 hours of employee exposure, which is equivalent to 100 employees working 2,000 hours per year. The IR for a particular injury category is based on: IR = number of cases x 200,000. MSHA also develops injury severity data by using days of missed work or days of restricted work activity and the 200,000-hour base as criteria. The severity measure (SM) for a particular injury category is based on: SM = sum of days missed or restricted x 200,000.

Prior to Construction (prior to December 1990)
No accidents were reported.

Construction and Start-up (December 1990 - May 1992)
WECo did not report any accidents during this timeframe. There were approximately 16 contractor-related accidents, but those accidents were reported under the contractor's identification number.

Extended Start-up (May 1992 - August 1993)
Information on two noise dosimetry cycles from late-1992 through mid-1993 for ACCP employees is shown in Table HLT-1. Figure HLT-1 indicates that all samples, for the same timeframe, are below MSHA reporting limits of a reading of 135 or more or that exposure on a time weighted average (TWA) is below 80 decibels.

Two first-aid reports, one incident report, and one medical reportable were filed in early Start-up. As Table HLT-2 shows, the ACCP Demonstration Facility has not had a lost time accident this reporting year and, as of the end of September 1992, had worked a total of 44,053.5 hours with an IR of zero and a SR of zero. Two accidents at the ACCP Demonstration Facility during 1993 were not reflected in the tabulated data: a facilities supervisor fell and fractured his wrist

February 12, 1993, resulting in 7 days lost time and $3,433.32 in compensation and medical costs. On July 13, 1993, a hand/wrist contusion resulted in $189.82 for medical treatment.

Demonstration Operation (August 1993 - ongoing)
As of July 1994, one first-aid report, two medical non-reportables, one medical reportable, and one incident report were filed. As of the end of 1994, the ACCP Facility has not had a lost time accident and has had a total of 63,872 hours with an IR of zero and a SM of zero.

- **Noise:** No noise data was collected during 1990, 1991, or early 1992.

- **Dust:** During MSHA Triple A inspections, sampling is done for respirable dust, which must be controlled at <2.0. If dust levels are found to be out of compliance, a MSHA designation work number (DWN) is initiated for a minimum of one year requiring bi-monthly sampling and dust conservation measures. A respirator fit test program is also initiated. As of March 1995, MSHA had not assigned an ACCP activity as a DWN for dust at the facility; therefore, no sampling has taken place.

6.4.2 Supplemental Monitoring

The spot checks were completed as requested; however, the tests were very sporadic around the actual mine site and not specific to the ACCP Demonstration Project. No data is included for supplemental reporting requirements.

Table HLT-1. Noise Dosimeter Readings

Employee	Date	Shift	Reading	Standard	OCC/Code
1	11/24/92	2	0.14	80	380
2	11/16/92	2	22.71	80	379
3	11/23/92	2	26.8	80	302
4	11/06/92	2	0.41	80	495
5	11/12/92	2	0.11	80	380
6	05/11/93	3	48.21	80	379
7	05/05/93	2	59.42	80	379
8	05/12/93	3	45.37	80	379
9	06/17/93	2	0.53	80	456
10	05/13/93	2	12.48	80	379
11	06/17/93	3	6.35	80	379

Figure HLT-1. Noise Dosimeter Readings

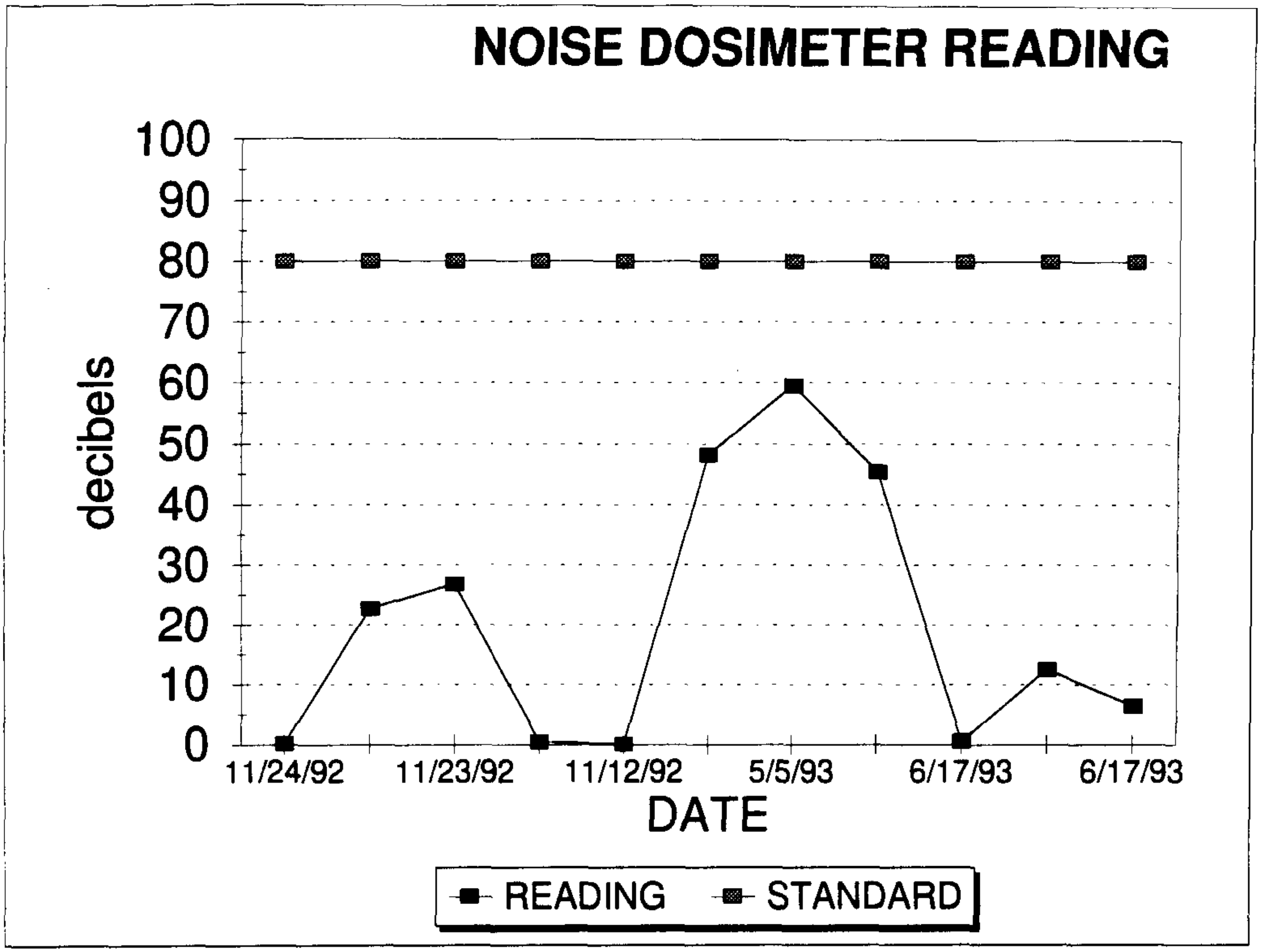


Table HLT-2. 1993 Health and Safety Data

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ytd.
LT	0	0	0	0	0	0	0	0	0	0
Days	0	0	0	0	0	0	0	0	0	0
Hrs.	4,523	4,542	5,116	4,782	4,813	4,880	5,000	5,138	5,260	44,054
IR	0	0	0	0	0	0	0	0	0	0
SR	0	0	0	0	0	0	0	0	0	0

6.5 Ecological Impacts

All ecological monitoring is compliance monitoring for existing mining operations. The monitoring is very extensive and covers everything including the areas affiliated with the ACCP Demonstration Facility.

6.5.1 Compliance Monitoring

From Prior to Construction to date, no major inconsistencies have been noted in big game populations, upland game birds, non-game wildlife, and fisheries. The development and operations of the ACCP Demonstration plant appear to have had little ecological impacts. Colstrip area wildlife is studied by WECo to determine population trends and to supply other data to comply with the State of Montana and federal laws, rules, and regulations as they existed during the reported years.

The ACCP facility is constructed entirely inside of an active mine area. The county has paved the road from Highway 39 to the mine entrance. The haul roads and access roads are continually watered to reduce the amount of dust in the air. Because the facility is located adjacent to an 80,000-ton, coal stockpile and unit train loadout facility, wildlife does not frequent this particular area. Also the vegetation in this area is quite sparse. No impacts are anticipated beyond the facility boundaries.

Mule deer and pronghorn antelope are the most common big game species in the proposed permit area although several white-tailed deer observations have been recorded. A small herd of elk is known to use an area several miles southwest of the area, and occasional sightings of elk have been recorded for Area C.

Sharp-tailed grouse have been active in the area. Raptors are common and nests of the golden eagle, prairie falcon, Cooper's hawk, red-tailed hawk, great horned owl, short-eared owl, long-eared owl, and northern harrier have been located in the area. Three bald eagles were once observed soaring above the area and were believed to be transients because there is no evidence of their nesting in the area. A peregrine falcon was also observed in the study area and was assumed to be transient.

Several shrub/grassland and shrub/tree habitat types provide cover, forage and fawning (nesting) sites for big game, grouse, raptors, songbirds and other species. Other habitats of limited acreage, but equally important to wildlife are the sandstone outcrops, and spring/seep and pond areas. One area of sandstone outcrop, approximately 13.2 acres known as "Eagle Rock", is particularly valuable as a golden eagle and falcon nesting site. The outcrop provides numerous nesting sites and is used more than most other outcrops in the area. In addition, the success rate for fledgling young is generally higher than elsewhere. The West Fork Armells Creek is important for wildlife habitat because of the concentration of rugged topography and dense vegetation in the intermittent reach with perennial pools which also supports thick vegetation. The creek is also important as a watering source. Ring-necked pheasant distribution is closely associated with riparian drainages of both the East Fork and upper portion of the West Fork Armells Creek. Observations of waterfowl have been restricted to area stock ponds and ephemeral streams. Castle Rock, as an erosional remnant, also provides topographic relief and, thus, provides additional diversity of wildlife habitat in a broad, open valley.

No threatened or endangered species are known to reside in the ACCP Facility area. In 1989, before the ACCP Facility was constructed, 197 species were evaluated; however, additional species have been included for the 1992-evaluation period. Appendix C lists 202 wildlife species observed from 1972 through 1992. A summary of the animals tracked/observed include:

- **Big Game**
  - Mule deer
  - White-tailed deer
  - Pronghorn Antelope
  - Elk
- **Upland Game Birds**
  - Sharp-tailed Grouse
  - Ring-necked Pheasant
  - Gray Partridge
  - Merriam's Turkey
- **Waterfowl**
  - Mallard
  - Western Canada Goose
- **Non-game Wildlife**
  - Large Predators: Coyote, Red Fox, Badger, and Others
  - Raptors: Prairie Falcon
  - Ciconiiformes: Great Blue Heron
  - Songbirds
  - Small Mammals
  - Rodentia: Black-tailed Prairie Dog
- **Fisheries**
  - Largemouth Bass

1992 Report Additional Species

- **Non-game Wildlife Extension:**
  - Lagomorpha
  - Reptiles and Amphibians: Sagebrush Lizard and Milk Snake

Since 1973 the study area size has been periodically altered. The present 91-square-mile study area, as shown in Figure ECO-1, has been in effect since 1986. To obtain data on the vast area, observation flights are performed.

Prior to Construction (prior to December 1990)

Big Game
Mule deer and pronghorn antelope aerial observation data for 1989 Prior to Construction of the ACCP Facility are shown in Table ECO-1. Mule deer and pronghorn antelope observations in each season are shown in Table ECO-2.

Mule deer productivity was calculated from the data obtained during an observation flight flown specifically for that purpose. In 1989, 53 mule deer does were observed with 72 fawns, making a fawn:doe ratio of 136:100. This is the highest productivity reported from 1973 through 1989, which indicates "excellent" productivity according to Eustace rating criteria (Ref. 4).

One white-tailed doe with 2 fawns was observed on October 3, 1989, in an alfalfa field.

Pronghorn antelope productivity was calculated from data obtained during an observation flight flown specifically for that purpose. During that flight 44 antelope does were observed with 38 fawns, giving a fawn:doe ratio of 86:100, indicating good productivity.

No elk were observed in 1989.

Upland Game Birds
In 1986, a 15-year, sharp-tailed grouse, low-density index of 1.7 per square mile occurred on the study area, concurrent with a 15-year regional low density (Ref. 3). In 1987, the estimated density index on the study area was 2.8 per square mile--a 5 percent increase over 1986. In 1988, the estimated density index on the study area was 5.1 per square mile--an 82 percent increase over 1987. During the lekking season of 1989, the density index on the study area was 4.1 per square mile--slightly above the study area 17-year average of 4.0. The increase in sharp-tail grouse density reflects the moderate 1988-1989 winter.

In 1989, 26 leks (a dancing/displaying ground for male sharp-tailed grouse) were censured of which 13 contained displaying males. One hundred twenty-five displaying males were observed on the 13 leks, averaging 9.6 displaying males per lek.

From 1976 through 1988 pheasant crowing counts were conducted along Armells Creek route. The route was not run in 1989; therefore, the numbers of the highest crowing counts for 1988 are shown in Table ECO-3.

No gray (Hungarian) partridge were observed in 1989.

In 1989, 225 turkeys were observed on the study area in 19 observations. Ten (56 percent) of the observations were in the ponderosa pine type; 7 (38 percent) were observed in adjacent upland grasslands; and 1 (6 percent) was observed in the agricultural type. The average number of turkeys per observation increased from 10.8 in 1988 to 11.8 in 1989.

Waterfowl
Mallards, the predominant waterfowl in the study area, were observed using permanent and temporary impoundments during spring and fall migrations. On April 11, 1989, 15 mallards, 4 pintails, 40 gadwalls, 5 blue-winged teal, and 8 northern shovelers were observed in a reclamation sediment control pond.

On April 4 and 13 and May 4 and 19, 1989, 2 pairs of Western Canadian geese were observed using 4 sediment ponds and grazing in reclamation areas. Five geese were observed in the Area A bison corral. On September 1, 1989, 8 geese were observed in Area A reclamation. The geese were probably from the group raised on the study area in 1988 (Ref 4).

A goose-nesting platform was constructed in the west end of the Area A sediment (bass) pond in anticipation of the 1990 nesting season. (Geese hatched in 1988 can be expected to nest in 1990).

Non-game Wildlife

- Large Predators

  Thirteen coyotes in 10 observations were observed on the study area (see Table ECO-4). The total aerial survey hours for coyotes are 1.5 hours greater than aerial survey hours for mule deer and antelope because the avian spring flight time was included. The average number of coyotes per observation was 1.30 in 1989, 1.00 in 1988, 1.10 in 1987 and 1.17 in 1986. The minimum estimated population index of 0.03 is the same as in 1988.

  One red fox was observed once in the study area.

  A badger was observed once in the reclamation vegetation type.

- Raptors

  In addition to the raptors discussed below, a Merlin and a Cooper's hawk were each observed once in the study area.

  Prairie falcon nesting history on the study area from 1988 through 1989 is shown in Table ECO-5. No active eyries were observed in 1989.

  - Gobblers Knob Prairie Falcon Hacking Project

    Fourteen prairie falcon fledglings were obtained--6 males and 8 females. Hacking, which is a method of releasing birds to reestablish a new nesting location, was done using the 3 hack boxes on Gobbler's Knob. The prairie falcons were released between July 14 and 17. They were observed in the immediate area until August 11. All 14 prairie falcons are believed to have successfully fledged.

Survival of prairie falcon fledglings to 1 year of age is estimated at 18 to 44 percent. Survival each year thereafter is estimated at 50 to 80 percent (Runde 1986). The statistical probability range of hacked prairie falcons returning to Gobbler's Knob for nesting is 2 to 6 falcons in 1989; 3 to 9 in 1990; and 9 to 18 in 1991. These estimates assume a successful hack of 14 falcons in 1990. The implication is that 1991 is the earliest probable year for the return of hacked prairie falcons to Gobbler's Knob.

The history of active and inactive golden eagle nest sites in the Colstrip vicinity for 1989 are shown in Table ECO-6. In 1988, a violent wind blew down nest 4. The nest was rebuilt in 1989 and was active. The tree with nest 5 died. One active red-tailed hawk nest was observed.

Three active great horned owl nests were observed. Soil stripping was done adjacent to Area C Rock on January 29, 1989, the optimal date for minimal raptor disturbance (Ref. 5). Subsequently, the nest was observed to contain three young.

Long-eared owl adults and young were observed on June 21, 1989, on a coal shovel in the Area A pit.

A burrowing owl was observed on April 13, 1989.

Forty-nine kestrel (a small falcon) nest boxes were placed in mining Areas A, B, C, and E and Pit 6 (see Table ECO-7). The ratio of kestrel eggs laid to fledglings is 52, 47, and 54 percent, respectively, for Areas A, B, and E and Pit 6.

- Ciconiiformes
  Five great blue herons were observed using a reclamation sediment pond on April 13, 1989.

- Songbirds
  Songbird and other avian species surveys were conducted in 47 sample sites: 12 grassland and 35 rock-outcrop. Four general vegetative/soil associations were surveyed: ponderosa pine/gumbo, ponderosa pine/sand, grass/gumbo and grass/sand. Thirty-four avian species were observed in the combined 47 trisects, with frequencies ranging from 0.021 to 0.343. The ponderosa pine/sand averaged slightly over twice as many avian species observed per unit area than the grass/gumbo and grass/sand associations.

- Small Mammals
  No small mammal trapping was done in 1989. (Small mammal trapping and songbird surveys are done on alternating years.)

- Rodentia

  An inactive prairie dog town of approximately 80+ acres is on the north edge of the study area. In 1987, prairie dogs were observed colonizing in an area 1 mile east of the inactive town. This new prairie dog colony remained active in 1988 and 1989.

Fisheries

Largemouth bass have continued to reproduce in the Area A sediment (bass) pond since 1981. In 1989, 159 largemouth bass averaging 10 inches long (252 mm) were transplanted from the Area A sediment (bass) pond into 8 other WECo ponds.

Construction and Start-up (December 1990-May 1992) and Extended Start-up (May 1992 -August 1993)

Big Game

Mule deer and pronghorn antelope aerial observation data for 1992 during dust mitigation investigations of the ACCP Facility are shown in Table ECO-8. Mule deer and pronghorn antelope observations in each season are shown in Table ECO-9.

Mule deer productivity was calculated from the data obtained during a systematic grid flight covering the entire area. Available telemetry data made it possible to report in more detail than in previous years. For example, from October and December flight data alone, the fawn:doe ratio was 42:100. Ground observations indicated a fawn:doe ratio of 57:100; however, collective observations of deer using mining areas A, B, and C show a fawn:doe ratio of 74:100. According to Dr. Richard Mackie, a reasonable fawn:doe ratio is 45:100 (Ref. 9). The 1991-92 research shows mule deer fawns on the study area to be significantly heavier/larger than the statewide average.

One white-tailed deer was observed.

Pronghorn antelope productivity was calculated from data obtained during an observation flight flown specifically for that purpose. During that flight 82 antelope does were observed with 47 fawns, giving a fawn:doe ratio of 57:100.

On July 8, 1992, twenty-four elk were observed approximately 2 miles southwest of the study area.

Upland Game Birds

During the 1992 lekking season, the estimated density index on the study area was 3.5 per square mile. The 20-year study area density index was 6.1 per square mile.

In 1992, 11 active arenas contained 106 displaying males, averaging 9.6 displaying males per arena.

In 1992, 18 (17 percent) of the study area's displaying males were on arenas in reclamation.

During January and February of 1990, 1991, and 1992, sharp-tailed grouse were commonly observed in Colstrip.

From 1976 through 1992, excluding 1989 and 1990, pheasant crowing counts were conducted along Armells Creek route. On May 8, 1992, 25 calls were recorded during 16 stops, averaging 1.6 calls per stop. Results are shown in Table ECO-10.

Waterfowl
Mallards were again observed using permanent and temporary impoundments during spring and fall migrations. Blue-winged teal, green-winged teal, bufflehead, American widgeon, American avocets, willet, common goldeneye, lesser scaup, northern shoveler, American coot, and wood duck were also observed.

Western Canada geese were observed using study area ponds in 1992.

Non-Game Wildlife

- Large Predators:
  Thirty-five coyotes in 13 aerial observations were observed on the study area. Thirty-eight coyotes were observed in 25 miscellaneous observations. The average number of coyotes per aerial observation was 2.70 compared to 1.30 in 1989, 1.00 in 1988, 1.10 in 1987 and 1.17 in 1986. The minimum estimated population index of 0.14 was the highest ever recorded. Depressed fur markets for the past several years may be increasing the coyote numbers. The results are shown in Table ECO-11.

  A mountain lion was shot over a deer kill by an outfitter in the Little Wolf Mountains west of the study area.

  A bobcat was observed on a road on the study area.

- Raptors
  No active eyries were observed in 1992 although prairie falcons were observed on the study area.

  - Gobblers Knob Prairie Falcon Hacking Project
    No updated information was given regarding the prairie falcon hacking project.

    Golden eagles are often observed roosting on Gobbler's Knob. On October 12, 1992, an aerial observation was made of two golden eagles attacking an adult male antelope. It is not known whether or not the attack was successful; however, golden eagles have been observed attacking (sometimes successfully) antelope, mule deer, big horn sheep, and mountain goats (Ref. 7).

Red-tailed hawks were observed often on the study area in 1992.

Five great horned owl nests were located on the study area. Three were known to produce young, one of which was in an active high wall in Area C. Great horned owl pellets from five sites were analyzed at the Montana State University Biology Department.

One kestrel pair successfully fledged young from an active mine high wall in Area B.

Harriers (a type of hawk) were often observed on the study area in 1992.

- Ciconiiformes
  One kingfisher was observed at a sediment pond in 1992.

- Songbirds
  Two, forty-acre, songbird transects are housed on the study area.

  The Pit 6 songbird transect has, at its center, a fenced shrub and tree enclosure. Planted in 1983, the enclosure was fenced to exclude cattle and encourage shrub and tree growth. Buffaloberry, cottonwood, Russian olive, and green ash were planted in this enclosure.

  In Pit 6, total vegetation coverage ranged from 42.1 to 93.1 percent. Macroplots with the highest coverage were characterized by high yellow sweetclover coverage. Perennial grasses (western, thickspike, and crested wheatgrass) composed the most important vegetation class in macroplots dominated by yellow sweetclover. Composition based on cover was predominantly native in 3 of 13 sampled macroplots (Ref. 2).

  Species' richness varied between 18 and 26 species per macroplot. The perennial grass vegetation class usually contained the most species, followed closely by annual forbs and perennial forbs.

  Canopy coverage of Area B macroplots ranged from 32 to 80.5 percent. Perennial grasses had the highest coverage in all but on macroplot. Wheatgrasses contributed to the majority of the coverage in Area B. Cover composition in 6 of the 13 macroplots exceeded 50 percent native vegetation (Ref. 2).

  Species richness ranged from 14 to 26 species per macroplot. The perennial grass and annual forb classes generally contained the greatest number of species.

- Small Mammals
  No small mammal trapping was done in 1992. (Small mammal trapping and songbird surveys are done on alternating years.)

- Rodentia

  The prairie dog town at the edge of the study area was observed to have 25± active burrows in 1992. A prairie dog was also observed running in Pit 6 reclamation on July 1, 1992; however, no colony has been observed near that location.

- Lagomorpha

  In 1992, whitetail jackrabbits were occasionally observed on the study area.

- Reptiles and Amphibians

  It is possible to reconstruct a sandstone outcrop upon which the sagebrush lizard can survive. The reconstructed outcrop can provide enough food sources and cover to support a group of lizards, as well as territorial space. Although reproduction is still a question, the evidence of a population size increase in the second year and the visual sighting of what appears to be a juvenile lizard indicate that reproduction is occurring.

  The early summer surveys indicated that several lizards were actively using the outcrop and were establishing and defending territorial areas. Additionally, a single lizard was seen on the outcrop that was estimated to be approximately one inch shorter and generally smaller and slighter than the rest of the population seen on the outcrop. In August, before any young emerged, the population was estimated at 24 individuals using the Heckel-Roughgarden method (Ref. 8). The population was estimated again in September after the expected emergence of young; however, no young were observed.

  One young milk snake was observed in a tree-soil field rock pile mound reclamation type.

Fisheries
No updated information was given for fisheries in 1992.

Demonstration Operation (August 1993 - ongoing)

Big Game
The deer population continued to increase in response to favorable habitat conditions. WECo continued funding special mule deer studies in cooperation with Montana State University.

Two hunting program opportunities were allowed on portions of the Rosebud Mine in 1993.

The 1993 minimum population index was 10.0 mule deer per square mile, which was 333 percent higher than the 20-year average of 3.0 deer per square mile. These Figure s were obtained using both radio-collared deer and helicopter surveys.

Mule deer productivity in 1993 was calculated from data obtained during four saturation flights covering the entire study area. The fall fawn:doe ratio was 75:100, and the winter fawn:doe ratio was 57:100. These ratios compare closely with 1992 data.

Pronghorn antelope productivity is calculated from aerial observation data. Observations revealed 103 antelope does with 60 fawns, giving a fawn:doe ration of 58:100 which almost identical to 1992's results (57:100).

On August 31, 1993, at 7 a.m., a cow moose was observed at the Area A Bass Pond. The moose moved between the Bass Pond and Armells Creek, staying in the area for several days. This is the first moose observed in the study area.

Upland Game Birds
During the 1993 lekking season, the density index on the study area was 3.9 per square mile. The 21-year study area density index average is 11.4 per square mile.

In 1993, 11 active arenas contained 106 displaying males averaging 10.8 displaying males per arena.

Lek R1 in Pit 6 reclamation area, which has been active since 1983, had 13 displaying males. Lek R7 in the Area A bison pasture had 8 displaying males. In 1993, 37 (31 percent) of the study are displaying males were on arenas in reclamation.

During January and February of 1990, 1991, 1992, and 1993, sharp-tailed grouse were commonly observed in Colstrip.

From 1976 through 1993, pheasant crowing counts have been periodically conducted along Armells Creek route. The study area contains a limited amount of very marginal, ring-necked pheasant habitat, typically in major drainages. On May 8, 1992, 26 calls were recorded during 16 stops, averaging 1.6 calls per stop. The average calls per stop have remained remarkably stable since 1986.

The first turkey nest ever located on the study area was found in the Stocker Creek drainage. The successful nest had 14 eggs. A turkey roost tree was also located.

A Hungarian Partridge hun was observed January 19, 1993, at a reclamation/ grassland site.

Waterfowl
Mallards, the predominant waterfowl in the study area, were observed using permanent and temporary impoundments during spring and fall migrations. A hen mallard nested successfully on a nesting platform in an Area C (east end) reclamation depression. Blue-winged teal, green-winged teal, gadwall, and bufflehead were also observed.

Western Canada geese were observed during study area ponds in 1993.

Non-Game Wildlife

- Large Predators

  Twenty-three coyotes were observed in 17 aerial observations on the study area. The average number of coyotes per aerial observation was 14. The minimum estimated population index of 0.06 was exactly the same as the 20-year average. Two foxes were observed hunting in spoil at 6.7, 12.4. One of the foxes had a small mammal in its mouth.

  A mountain lion was shot over a deer kill by an outfitter off of the study area in the Little Wolf Mountains to the west.

  One bobcat was observed on a road at C.8, 11.4.

- Raptors

  No active eyries were observed in 1992 although prairie falcons were observed in the study area. In January, a prairie falcon was observed roosting on a wire spool by the Reclamation Building.

  Golden eagles were observed roosting on Gobbler's Knob.

  From November 1992 through January 1993, two, adult, unclassified, bald eagles were often observed in the study area frequently feeding on road-killed mule deer.

  Red-tailed hawks were observed often in the study area in 1993. An active nest in a Ponderosa pine tree were observed at Latilong F10, 13.1.

  A great horned owl nest with three fledglings was found in the Area C coal conveyor structure. This is the first great horned owl ground nest noted in the study area.

  An active great horned owl nest was observed in Eagle Rock, Area C, on a sandstone ledge.

  On March 5, 1993, an injured great horned owl was found at the Area E tipple load-out. Bruce Waage of WECo and Chris Anderson, a Fish Wildlife & Parks Game Warden, captured the owl and took it to a Billings' veterinarian. The injured owl was incapable of moving, and its mate was bringing it food --a vole and a pocket gopher had been placed beside it. The pair was suspected to be nesting in the area.
  Area A Field 4888 nest box produced 4 young, which were banded. An Area C (by county road) nest box also produced 4 young, which were banded along with the adult female kestrel. A Pit 6 nest box produced 3 young. The four nest boxes yielded 14 young, an average of 3.5 young per box.

  In 1992, an active kestrel nest was noted in an Area B active Highwall (west end).

Harriers were often observed in the stud are in 1992.

A sharp-skinned hawk was observed September 14, 1993, flying over a reclamation area (Latilong H10, 12.1) while unsuccessfully attacking a songbird.

A snowy owl was observed April 1, 1993, sitting on a fence post in a reclaimed area at Latilong 12,12.4. This is the first snowy owl observation made in the study area.

- Songbirds
  In 1993, 18 bluebird nest boxes were placed in reclamation areas. One used by bluebirds in Area C fledged 6 young. One kestrel nest box used by mountain bluebirds in Area C fledged 4 young. This is the first year (1993) that mountain bluebirds have been known to nest in reclamation areas.

- Small Mammals
  Two traplines were run (10 Sherman live traps and 10 snap traps) at two locations for 20 trap-nights each in Area A Reclamation-Grassland Type north of the bison pasture. Two western deer mice (an adult male and a sub-adult male) and a prairie mole were caught on October 20, 1994. On October 21, 1994, an adult male and a sub-adult female western deer mice were caught.

  Two traplines were run (10 Sherman live traps and 10 snap traps) at two locations for 20 trap-nights each in an Area B west-end Reclamation-Grassland Type. On October 20, 1994, a sub-adult female and an adult western deer mouse and an adult prairie mole were caught. On October 21, 1994, two adult female and two sub-adult male western deer mice were caught.

- Rodentia
  Prairie dogs were observed in the prairie dog colony at J.10, 10.7.

- Reptiles and Amphibians
  Sagebrush lizards were observed in sandstone outcrops in Area A reclamation.
  Western chorus were observed in large numbers in a reclamation area sheet-water pond below thin-peaks. This is the first observation of western chorus frogs in the study area.

Fisheries
No updated information was given for fisheries in 1993.

6.5.2 Supplemental Monitoring

No additional monitoring is required.

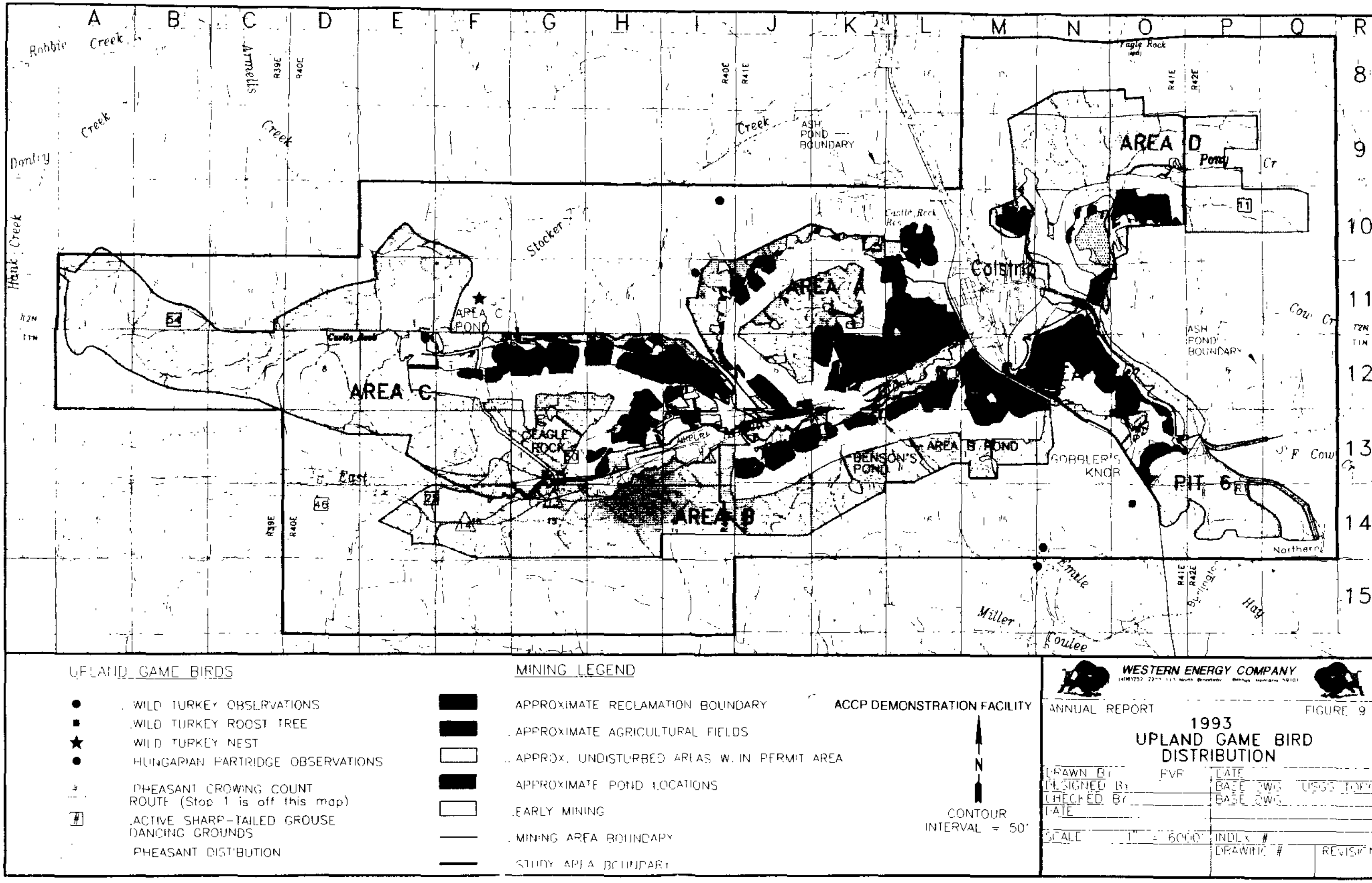


Figure ECO-1. Study Area

Table ECO-1. Aerial Observations of Mule Deer/Antelope on the Western Energy Company Survey Area (Prior to Construction)

Animal	Year	Total Air Hours	No. Observed	Avg. No. Observed per Hr. of Flight	Maximum Count (a)	Min. Population Index per sq. mile
Prior to Construction						
Mule Deer	1989	11.5	729	63.4	387	4.3
Antelope	1989	11.5	205	17.8	111	1.2
Mule Deer	1990	11.9	1,156	97.1	474	5.2
Antelope	1990	11.9	445	37.4	151	1.7

(a) Maximum count on a complete aerial survey.

Table ECO-2. Aerial Observations of Number of Mule Deer/Pronghorn Antelope in Each Season on the Western Energy Company Survey Area

Animal	Season	Winter	Spring (a)	Summer	Autumn	Total
Prior to Construction						
Mule Deer	Seasonal Totals	387 (50) b	--	71 (29)	271 (46)	729 (125)
Pronghorn Antelope	Seasonal Totals	63 (3) b	--	111 (18)	31 (1)	205 (22)

a Spring observations were classified as "miscellaneous" because the usual systematic grid pattern was not flown.

b Number of individual (number of observations).

Table ECO-3. Dates and Numbers of Highest Ring-Necked Pheasant Crowning Counts on the Western Energy Company Survey Area.

	Stop No.																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Totals**	**Avg. Calls/Stop #**
Prior to Construction																		
5/15/88	1	1	1	1	1	2	4	2	1	0	0	3	3	1	3	2	26	1.6
x/89 and x/90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

x Route not run in 1989 or 1990.

Table ECO-4. Coyotes Observed on the Western Energy Company Survey Area.

Year	Total No. Observed (Air & Ground)	Total Aerial Survey Hrs	No. Observed from Air Only	Avg. No. Observed/Hour of Flight	Max. Count(a)	Min Population Index (Coyotes/Sq. Mi.)
Prior to Construction						
1989	13(10)b	13	13	1	3	0.03
1990	14(13)	11.9	14	1.2	6	0.07

(a) Maximum count on a complete aerial survey
(b) Number ovserved/(Number of observations).

Table ECO-5. Prairie Falcon Nesting History on and within 1/2 Mile Outside the Western Energy Company Survey Area Boundary

Eyrie Name	Nest No.	1988 ACHF#	1989 ACHF
Pit 6	1	I---	I---
North Castle Rock	3	I---	I---
Upper Lee Coulee	4	I---	I---
Eagle Rock	5	I---	I---
Area C Rock	7	IGHO	IGHO
North Eagle Rock	9	I---	I---

I - Inactive
GHO - Great Horned Owl
- A=Active; C=Clutch; H=Hatched; F=Fledged

Table ECO-6. 1988 and 1989 Active and Inactive Golden Eagle Nest Sites in the Colstrip Vicinity

Substrate	Nest No.	1988	1989
Sandstone	1	I	I
Sandstone	2	I	I
Ponderosa Pine	3	I	I
Ponderosa Pine	4	Ab	A
Ponderosa Pine	5	I	I
Ponderosa Pine	6	Aab	UNK
Sandstone	7	I	I
Sandstone	8	I	I
Ponderosa Pine	9	I	I

A - Active
I - Inactive
UNK - Unknown
a - Adult, juvenile pair; observed regularly
b - Nest destroyed by windstorm

Table ECO-7. 1989 Kestrel Nest Box Data

	Area A	Area B	Area C	Area E & Pit 6	Total
Nest Boxes	8	7	25	9	49
Active Nests	6	5	16	4	31
Largest Nest Clutch	6	5	--	4	--
Largest Nest Hatch	5	5	--	4	--
Eggs	33	17	68	13	131
Hatched	30	12	--	13	55
Fledged	20	8	--	7	35
Banded	17	8	--	7	32

Table ECO-8. Aerial Observations of Mule Deer/Antelope on the Western Energy Company Survey Area (Construction and Start-Up)

Animal	Year	Total Air Hours	No. Observed	Avg. No. Observed per Hr. of Flight	Maximum Count (a)	Min. Population Index per sq. mile
Construction and Start-up						
Mule Deer	1991	8	685	85.6	320	3.5
Antelope	1991	8	281	35.1	116	1.3
Extended Start-up						
Mule Deer	1992	17.2	1,533	89.1	370	4.1
Antelope	1992	17.2	622	36.2	274	3.0

(a) Maximum count on a complete aerial survey.

Table ECO-9. Aerial Observations of Number of Mule Deer/Pronghorn Antelope in Each Season on the Western Energy Company Survey Area (Extended Start-Up)

Animal	Season	Winter	Spring (a)	Summer	Autumn	Total
Extended Start-Up						
Pronghorn Antelope	Seasonal Totals	285 (12) b	169 (11)	166 (38)	157 (15)	777 (76)

a Spring observations were classified as "miscellaneous" because the usual systematic grid pattern was not flown.

b Number of individual (number of observations)

Table ECO-10. Dates and Numbers of Highest Ring-Necked Pheasant Crowning Counts on the Western Energy Company Survey Area.

	Stop No.																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Totals	Avg. Calls/Stop #
Construction / Startup																		
5/16/91	1	2	2	1	2	3	1	2	0	0	2	3	3	2	1	2	27	1.7
Extended Startup																		
5/8/92	1	4	2	5	0	0	0	3	2	2	1	0	0	2	1	2	25	1.6

Table ECO-11. Coyotes Observed on the Western Energy Company Survey Area.

Year	Total No. Observed (Air & Ground)	Total Aerial Survey Hrs	No. Observed from Air Only	Avg. No. Observed/Hour of Flight	Max. Count(a)	Min Population Index (Coyotes/Sq. Mi.)
Construction and Startup						
1991	15 (11)b	8	5	0.6	3	0.03
Extended Startup						
1992	57(37)b	17.2	20	1.2	13	0.14

(a) Maximum count on a complete aerial survey
(b) Number ovserved/(Number of observations).

7.0 Conclusions and Recommendations

This Environmental Report examines the impacts, if any, the ACCP Demonstration Facility has had on the environment throughout the project's historical development. The specific areas evaluated in this report include Air Quality, Water Quality, Solid Waste Disposal, Health and Safety, and Ecological Impacts.

7.1 Conclusions

7.1.1 Air Quality

There are two main types of air quality monitoring for the ACCP Demonstration Facility: particulate and stack emissions. Also reported are average process results for supplemental monitoring: combustion air pressure and temperature, natural gas flow and pressure, and stack temperature.

Ambient Air Particulate Testing: Total suspended particulate (TSP) data had been collected until May 12, 1992, when PM_{10} data collection was initiated according to the Montana and federal ambient particulate standards. There are eight monitoring stations for Colstrip: 1A, 1B, 9, 10, 11, 12, 13, and 14. Of the eight sites, four sites: 1A, 1B, 9, and 14 indicate impacts from the ACCP Demonstration Facility. The results according to the project time-line were within the standard except during construction, startup, and stabilization activities. These above-standard readings were easily traceable and were due to increased activities in the area or to poor weather conditions.

Stack Emission Testing: Emission testing for the ACCP Demonstration Facility performed in 1993 indicated that particulate emissions for the east outlet duct of baghouse D-8-56 averaged 0.0013 gr./dscf. The west outlet duct, the worst case of the two outlets ducts, registered average particulate emissions of 0.0027 gr./dscf or 15 percent of the 0.018 gr./dscf limit.

During the 1993 sampling, particulate emissions from the thermal process stack averaged 0.0158 gr./dscf or 51 percent of the 0.031 gr./dscf limit. Additional stack testing on May 18, 1994, determined the discharge rate of carbon monoxide, sulfur dioxide, and particulate and nitrogen oxides from the process stack. The results indicated that the assumptions in which the ACCP air quality permit were based on were valid. That is, no gaseous pollutant discharge rates were greater than 100 tons per year. However, the carbon monoxide emission rate, which was slightly higher than predicted, was probably due to the combined results of high inlet gas temperatures to the first-stage dryers and low oxygen levels in the furnace. The project modifications scheduled for the 1995 outage will address the high gas temperatures; however, the low oxygen levels will not be corrected at this time. The testing also confirmed that the particulate emissions are still below the permit level.

Process Parameters:

Combustion air pressure and temperature remained fairly consistent throughout project development. As operations became more efficient, natural gas flow rates and pressures continued to increase toward design specifications. Stack gas temperature actually decreased slightly as process performance was optimized.

7.1.2. Water Quality

Water quality compliance monitoring at the Rosebud Mine is very extensive. Approximately 434 groundwater wells at various depths and geological structures are monitored. The major importance of groundwater and surface water in the Colstrip vicinity is for livestock and wildlife uses; therefore, the criteria is slightly less stringent than for typical standard drinking water permissible levels.

Ten of the 434 groundwater wells were selected based on which wells would be impacted the most by the ACCP Demonstration Facility according to depth and proximity, both upgradient and downgradient to the Facility, to report water quality data for this report. The results were evaluated according to the following: 1) results of water analyses vs. water quality limits; 2) Prior to Construction (base-line data) vs. ACCP development timeline, and 3) upgradient wells (background) vs. downgradient. Also reported as supplemental monitoring results are average temperature results for cooling water supply and return.

Water quality results indicated there was no impact to the water quality throughout the ACCP Project's development. The additional constituents that were monitored before and during construction were comparable to base-line data and were within the required limits. Additional sampling indicated slightly higher total dissolved solids, conductivity, and hardness levels in the spoil wells during the extended start-up period when compared with the base-line; however, the elevated levels can be related to the geology of the overburden being backfilled. From 1992 to 1993, water quality improved from the base-line data. Water quality upgradient of the ACCP Facility, monitoring wells WR-104 and WS-107, were compared with the remaining downgradient monitoring wells. Again, these results indicated there was no impact to water quality from constructing and operating the ACCP Demonstration Facility.

The cooling water supply and return temperatures were consistent throughout the historical development of the ACCP Demonstration Facility. The temperatures are well within the design limits for the cooling water tower.

7.1.3 Solid Waste Disposal

Solid Waste Disposal monitoring consisted of evaluating the actual slack material and process fines, the groundwater around the slack disposal area, the groundwater around the slurry pit, and the actual slurry.

Raw coal inlet flows were taken to estimate the amount of waste that could be expected based on rates. Additional information based on coal analyses, product coal analyses and flows were not available to do more detailed material balances.

Test results from the slack material indicated that the materials are non-hazardous and non-toxic forming. Groundwater testing revealed that the method currently used to dispose of the slack has not degraded post-mine groundwater quality beyond what is normally expected or accepted in relation to pre-mine groundwater quality which tends to be marginal. The data also provides evidence that there has been no impact on post-mine groundwater quality due to the oxidation of pyrites in the buried pit slack.

As operations became more efficient throughout the project development, more coal was processed producing more product, slack and fines.

7.1.4 Health and Safety

The ACCP facility's employees' health and safety is a priority with the employees and with management. The ACCP Facility has had very low incident rates and severity rates with only minor incidents throughout the project's duration to date. All samples taken from mid-1992 through late-1993 indicate that noise readings were all below MSHA reporting limits of 135 decibels. Regular respirable dust inspections are also conducted by MSHA at the Facility.

7.1.5 Ecological Impacts

The ACCP Facility is constructed entirely inside of an active mine area. Because the Facility is located adjacent to an 80,000-ton, coal stockpile and unit train loadout facility, wildlife do not frequent this particular area. Also, the vegetation in this area is quite sparse. No impacts are anticipated beyond the Facility boundaries.

Mule deer and pronghorn antelope are the most common big game species in the proposed permit area although several white-tailed deer observations have been recorded. A small herd of elk is known to use an area several miles southwest of the area, and occasional elk sightings have been recorded for Area C.

Sharp-tailed grouse have been active in the area. Raptors are common and nests of the golden eagle, prairie falcon, Cooper's hawk, red-tailed hawk, great horned owl, short-eared owl, long-eared owl, and northern harrier have been located in the area. Three bald eagles were once observed soaring above the area and were believed to be transients because there is no evidence of their nesting in the area. A peregrine falcon was also observed in the study area and was assumed to be transient.

Several shrub/grassland and shrub/tree habitat types provide cover, forage and fawning (nesting) sites for big game, grouse, raptors, songbirds and other species. Other habitats of limited acreage, but equally important to wildlife, are the sandstone outcrops, and spring/seep and pond areas. One area of sandstone outcrop, approximately 13.2 acres known as "Eagle Rock", is particularly valuable as a golden eagle and falcon nesting site. The outcrop provides numerous nesting sites and is used more than most other outcrops in the area. In addition, the success rate for fledgling young is generally higher than elsewhere. The West Fork Armells Creek is important for wildlife habitat because of the concentration of rugged topography and dense vegetation in the intermittent reach with perennial pools which also supports thick vegetation. The creek is also important as a watering source. Ring-necked pheasant distribution is closely associated with riparian drainages of both the East Fork and upper portion of the West Fork Armells Creek. Observations of waterfowl have been restricted to area stock ponds and ephemeral streams. Castle Rock, as an erosion remnant, also provides topographic relief and, thus, provides additional diversity of wildlife habitat in a broad, open valley.

From Prior to Construction to date, no major inconsistencies have been noted in big game populations, upland game birds, non-game wildlife, and fisheries. The development and operations of the ACCP Demonstration Facility appear to have had little ecological impacts.

7.2 Recommendations

Current monitoring and compliance tasks are complete and cover all major aspects that could potentially be impacted by the ACCP Demonstration Facility. Past monitoring has been more than sufficient to evaluate the environmental impacts caused by the development of the ACCP Demonstration Facility throughout the historical timeline. No major environmental impacts from the ACCP Demonstration were found.

Now that the facility is constructed and operational, the focus of monitoring and compliance should be directed more towards specific testing on various coals or treatment technologies for stabilization and dust mitigation. Therefore, the only recommendation, based on the data collected for this report, is to perform process testing and evaluation based on the various coals processed and any techniques used for product stabilization. The types of monitoring that should be performed are those typically needed for material and energy balances, such as:

- analyzing coal prior to processing;
- determining the amount of raw coal being processed;
- analyzing the emissions during processing;
- analyzing any waste;
- determining the amount of waste generated;
- analyzing the product;
- determining the amount of clean product produced; and
- gathering information on any chemical used for stabilization.

These forms of monitoring will determine if one coal type or treatment type impacts the environment more than another, how and why this coal or treatment type impacts the environment, and what can be done to limit the amount of environmental impact.

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Appendix A.

Calibration Data

Appendix B.

Compliance Monitoring Reporting

Appendix C.

Species List of Animal and Avian Taxa Observed on the Western Energy Company Survey Areas at Colstrip, Montana From 1972 Through 1993